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Skyways

Flight Operations • Engineering • Management

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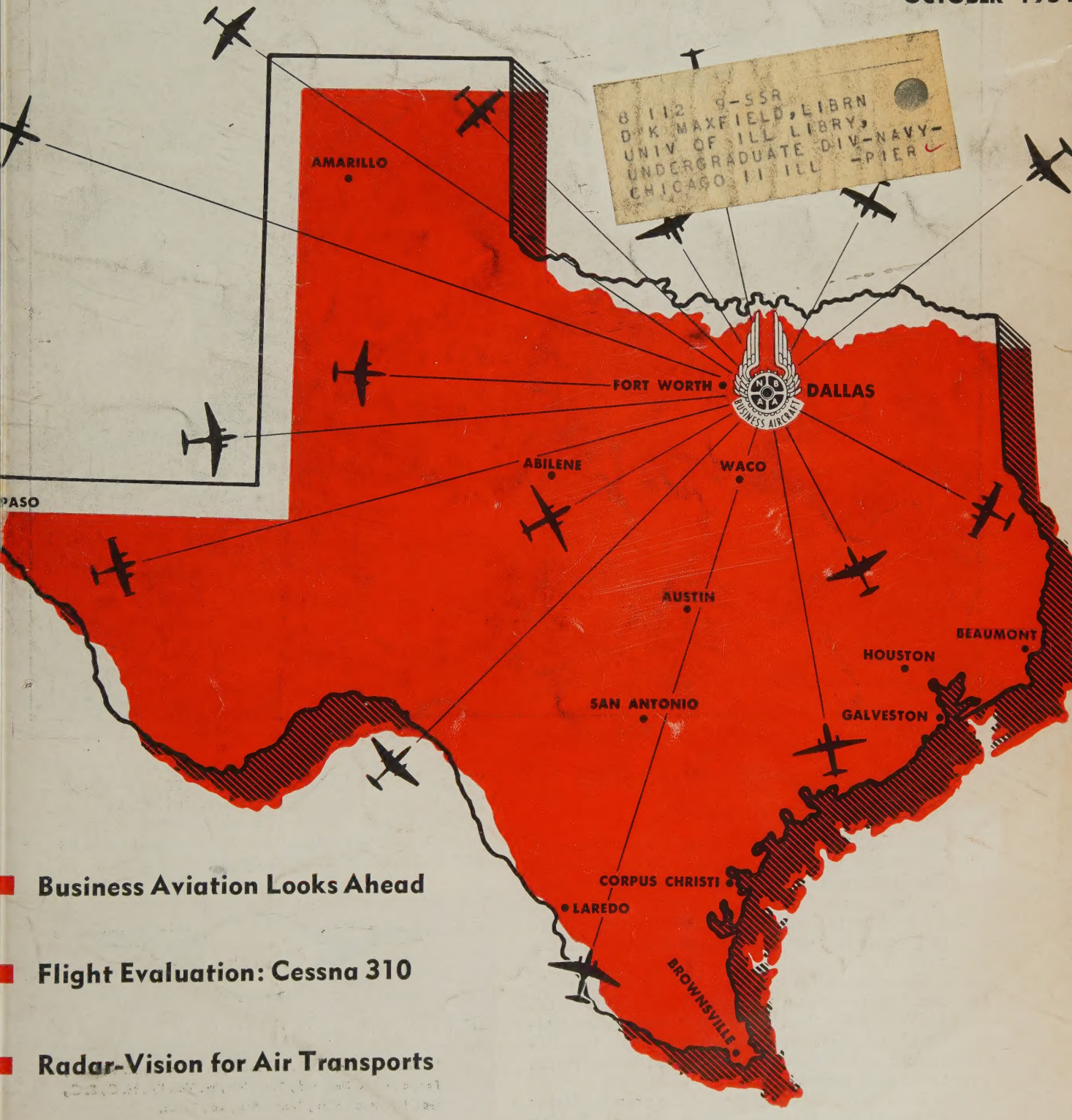

- Business Aviation Looks Ahead
- Flight Evaluation: Cessna 310
- Radar-Vision for Air Transports
- Flight Operations Round Table: Business-Pilot Proficiency

50c

Only a synthetic oil meets its lubrication specs.

How tough are lubricant specifications for new U. S. turbo jets? Well, they call for an oil pumpable at -65 degrees F, yet able to lubricate critical turbine bearings at over 450 degrees F. They call for flash point, viscosity, and load-carrying properties that just can't be combined in any existing mineral oil.

Esso research teams went to work on the problem. The result is a synthetic oil, Esso Turbo Oil 15. With more than 200,000 hours of engine test-stand and flight experience, it has met all specifications and tremendously increased turbo jet and turbo-prop performance.

Esso Turbo Oil 15 lubricated the premier flights of the North American F-100 (above), Boeing 707 and B-52, Convair F-102, Douglas A4D. A proud record for the Esso research teams.

Continuing research at Esso laboratories promises an even greater future for synthetic oils as gas turbine performance reaches new highs.

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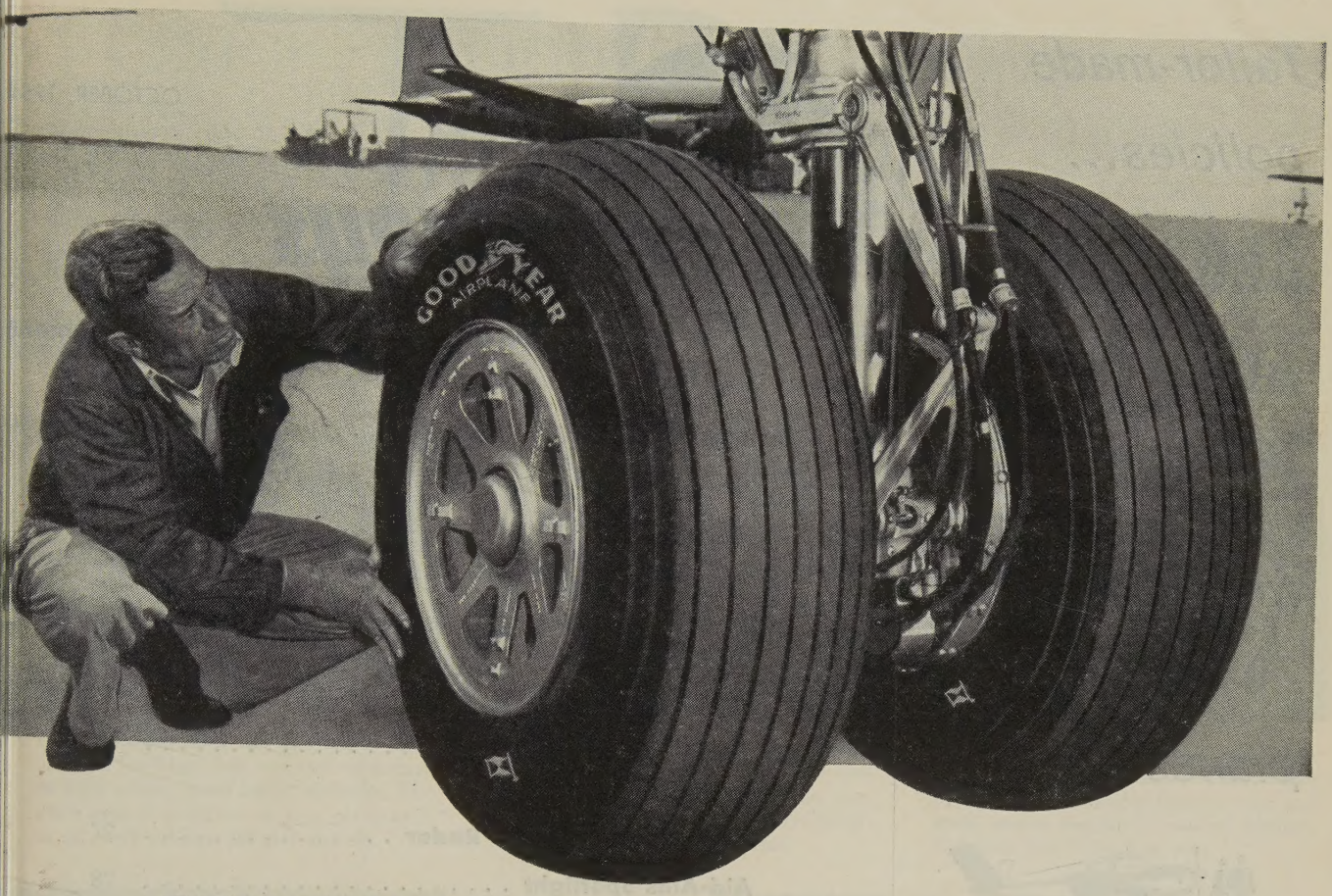
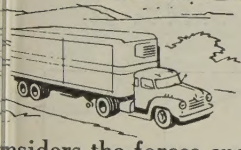


TEN TIMES STRONGER THAN TRUCK WHEELS OF SAME WEIGHT!



Once an airplane touches the ground, it is out of its element. That is where its wheels take over a task which is truly Herculean, when one nsiders the forces encountered.

rplane wheels must withstand pressures of 1000 pounds per square ch—and more—in order to qualify for this exacting service.

mpounding the problem is the fact that the rotating disc of the brake echanism is geared to the wheel structure. So the wheel must transmit e torque generated by the retarding action of the brake.

reover, the wheel must be able to withstand the tremendous demands tire pressure, shock loading, static loading, side loading and torque ding—often in simultaneous combination.

this must be engineered into the airplane wheel—*a structure which st, above all, be exceedingly light for its weight!*

the past ten years, Goodyear research has advanced the design of plane wheels from 190 pounds average load capacity per pound of eel *to 250 pound capacity*. It has pioneered the "wave-type" design ich is easier to cast and machine — has utilized strain gauge, stress t, load machines, burst and flight tests—constantly researching and *ding* new ways to improve upon one of man's oldest inventions—the eel—for the betterment of aviation progress.

Goodyear, Aviation Products Division
Akron 16, Ohio or Los Angeles 54, California

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From the North America Companies' own Aviation Department comes the broadest, most modern protection for private and company-owned aircraft.

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OCTOBER, 1954

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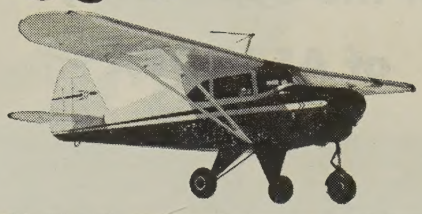
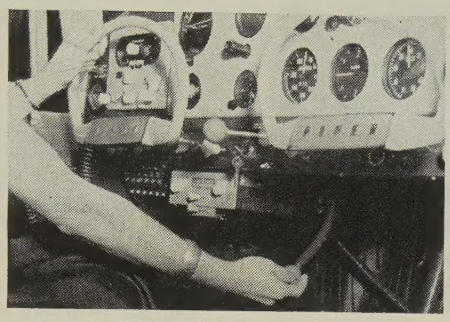
Tri-Pacer

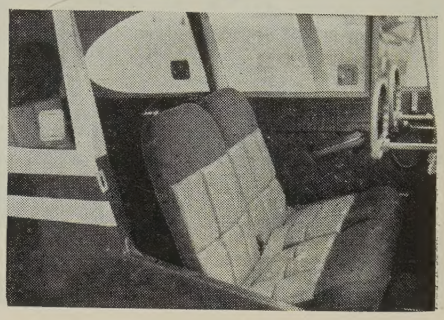


the FAVORITE because...

TRICYCLE GEAR takes the skill out of take-offs and landings; lets you taxi with ease in high winds; gives better visibility. Tricycle gear is as logical on your plane as it is on every modern jet and airliner.



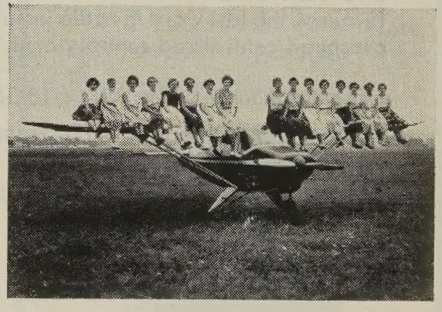
HANDLING EASE Single hand brake brings Tri-Pacer to safe, short stop. Inter-connected ailerons and rudder let you steer with wheel alone or feet alone. Tri-Pacer's the easiest-to-fly plane available.



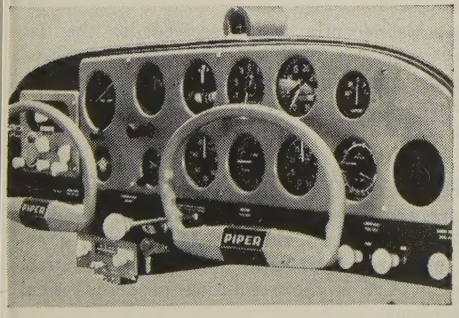
COMFORT Foam rubber seats assure restful flight. Individual ventilators keep cabin cool in summer; double heaters, front and back, assure warmth in coldest weather. Generous sound-proofing, too.

ECONOMY Priced nearly $2,000 less than other production four-place planes, the Tri-Pacer averages 15 miles per gallon, costs less than 2 cents per passenger mile, including direct and indirect costs.

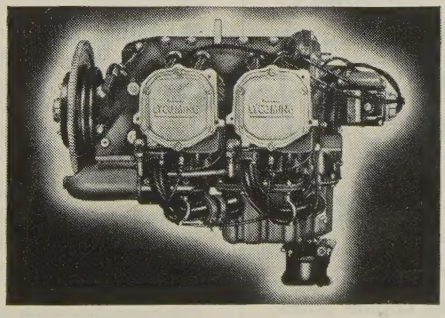
BIG BAGGAGE compartment has 100 pound capacity and large separate door. Rear seat can be quickly removed to carry freight, which is easily loaded through exclusive rear door on left side.



RUGGEDNESS Tri-Pacer is really built! Welded steel fuselage and all-aluminum wing structure are covered with exclusive non-flammable, long-lasting Duraclad plastic finish for utmost reliability.



FULL PANEL accommodates gyro instruments including artificial horizon, Omni, homing loop, VHF transmitter, VHF and LF receiver—all standard in Super Custom plus other deluxe equipment.

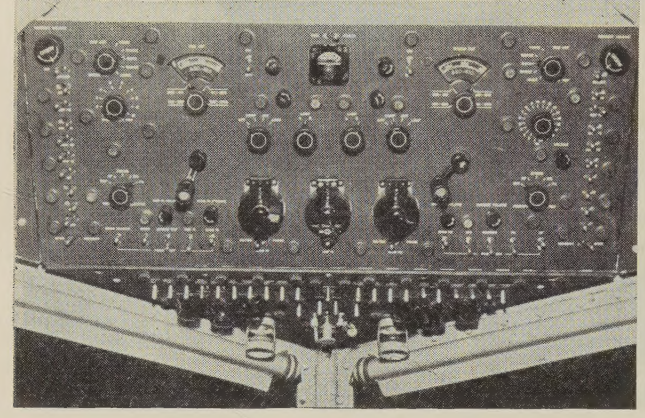


SMOOTH RELIABLE POWER Lycoming engine is rated one of smoothest, most dependable engines ever developed for business aircraft. Low maintenance requirements help explain Tri-Pacer's economy.

PERFORMANCE For safe, practical cross-country transportation, the Tri-Pacer proves itself beyond question. Over 120 mph cruise, fast climb. Fly it and you'll say it's your favorite, too. Send for brochure.

PIPER AIRCRAFT CORPORATION Lock Haven, Pennsylvania

Another Example of the Superiority of AERODEX



No DC-3 Ever Had It So Good . . .

When progressive Union Carbide decided to expand their Executive aircraft fleet, they wanted the best of everything. Aerodex furnished an Executive DC-3 which embodied, among other features, the last word in radio installation, with overhead centralized control panel. It included:

- *Twenty-Channel Collins 18s–4/18OL Transceiver*
- *Collins 51R—3 Receiver—17L Transmitter*
- *2 ARC—T11—B Transmitters*
- *2 Collins 51R—3/51V—VOR and ILS*
- *2 Bendix MN62 Automatic Radio Direction Finders*
- *2 Bendix MN6O Iron Core Loops*
- *Bendix MN61 Marker Beacon Receiver*
- *RM1 Indicators*
- *Sperry Zero Reader*
- *Sperry C-4 Gyro*
- *A-12 Autopilot*
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industry notes . . .

■ Pastushin Aviation Corp., Los Angeles, recently was awarded a $758,657 contract for the production of 300-gallon jettisonable fuel tanks for the USAF's F-89D, long-range, all-weather interceptor built by Northrop.

■ The Air Materiel Command of the Air Force has awarded a contract to All American Engineering Co., Wilmington, Del., for the design and fabrication of a runway over-run barrier. To be built roughly like a giant, elastic tennis net, the barrier would be placed near the end of a runway to bring a plane to a safe stop when certain emergency conditions arise, *i.e.* over-shooting the runway or failure to gain proper airspeed on take-off. Purpose of this new project is to develop a high-performance barrier for use with high-speed jet aircraft.

■ North American Aviation, Inc. has been sub-licensed to manufacture transilluminated lighting panels under Patent No. 2,602,036. The arrangements were negotiated through Wesco Plastic Products of Venice, Calif., Pacific Coast licensees of the owner of the patent, Universal Aviation Equipment, Inc.

■ Continental Aviation & Engineering's new $2 million facilities contract from the Air Force provides production facilities for the J69 turbojet. This engine powers the T37 twin-jet trainer Cessna Aircraft is building for the Air Force. The same basic engine also powers the *Firebee* target drone built by Ryan Aeronautical Co., San Diego.

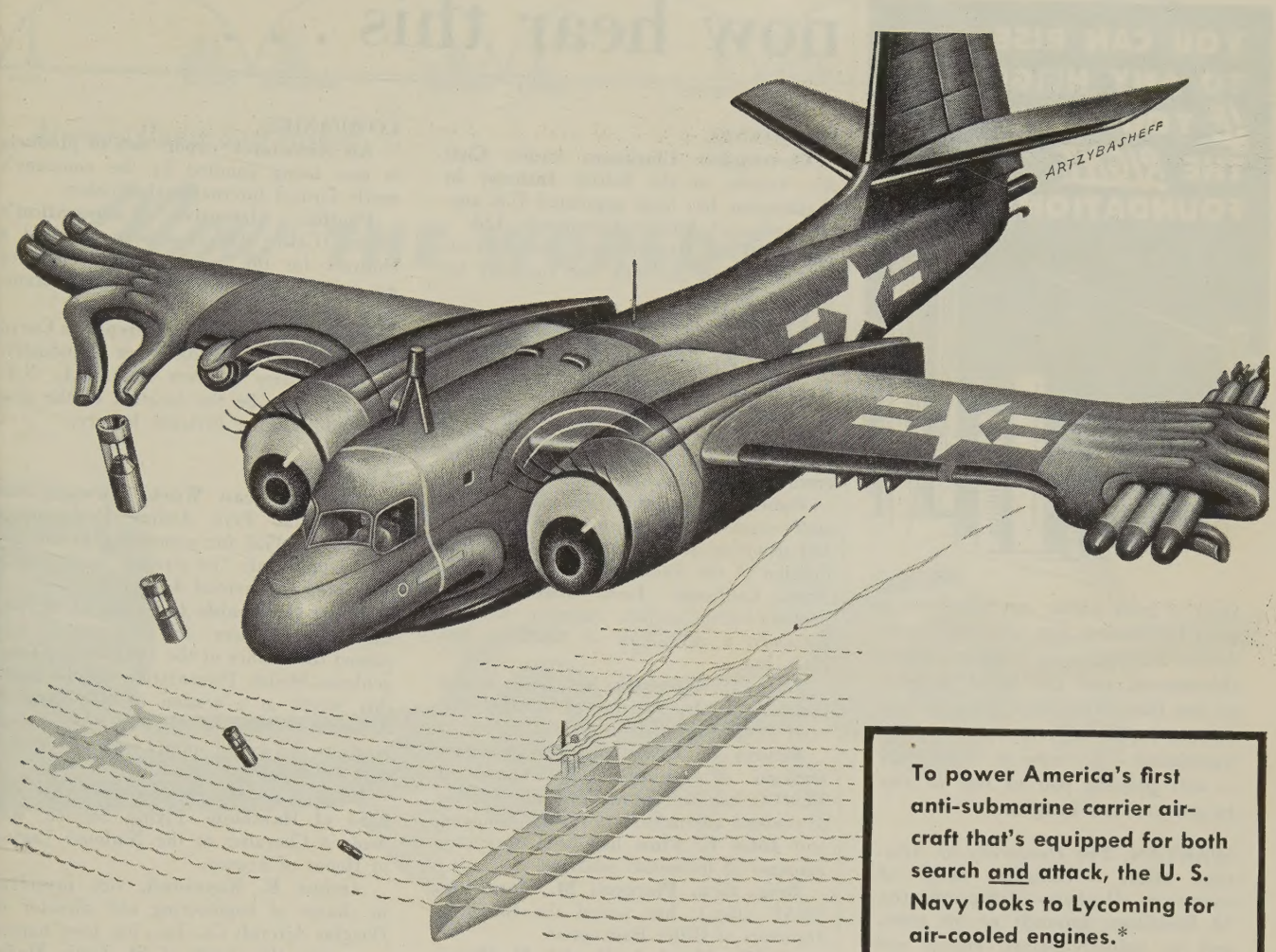
■ A new, enlarged model of the DC-7 has gone into production at Douglas Aircraft. Designated the DC-7C, the new transport has a 10-foot greater wing span, a 3-foot longer fuselage and 2-foot taller vertical tail structure. With an operating range of more than 5,000 miles, the DC-7C is expected to enable trans-Atlantic airline operators to trim from three to five hours off Westbound schedules and one and a half to three hours off Eastbound routes. The DC-7C will cruise at 350 mph with a full payload, and it is expected to go into operation by the summer of 1956.

■ Development of a new rocket-assist system for helicopters recently was announced by the Navy and Reaction Motors, Inc., Rockaway, N.J. Installed for test purposes on a Sikorsky HRS-2, the device consists of rotor tip-mounted liquid-propellant rockets that can be turned on to give extra power for take-off with heavy loads or at high altitudes. The device is said to provide a boost equal to a 20% increase in engine power. Called ROR (Rocket-On-Rotor), the unit weighs 67 pounds for a three-bladed rotor installation. It burns hydrogen peroxide fuel and enough is carried for 20 to 25 take-offs or six minutes steady use.

■ Flying Safety Awards recently were received by the 1st Weather Wing of the USAF Air Weather Service and its three reconnaissance squadrons for flying 3½ million accident free miles. This is equivalent to 150 flights around the world. The awards were made at Hickam AFB in Hawaii.

■ Northeast Airlines, Slick Airways, Inc., Westrex Corp., and Decca Navigator System, Inc. recently were accepted for membership in the Radio Technical Commission for Aeronautics, a co-operative association of government and industry aeronautical agencies. Objective of RTCA is the resolution of aeronautical tele-communication problems.

■ The Convair *Freighter*, a commercial transport capable of hauling up to 15,000 pounds of cargo over medium airline ranges at a cruising speed of 280 mph, has been announced by Convair, a Division of General Dynamics Corp. The new design incorporates the operating economy and performance of the *Convair-Liner* 340 and, externally, the *Freighter* will look much like its passenger-carrying counterpart.



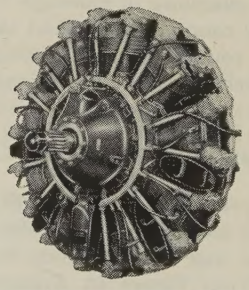
Stout "hearts" for new Navy sub killers

Patrolling endless seas in search of enemy subs . . . blasting them out of action with newest destruction devices . . . this Grumman S2F-1 "hunter-killer" depends on the stamina of twin Lycoming-built engines to keep it high and dry.

This is another Lycoming contribution to aviation progress. For Lycoming engines also fly military missions in aircraft ranging from liaison planes to trainers to helicopters. They have distinguished themselves in civilian aviation, too—particularly in single- and twin-engine planes.

Do *you* need this kind of dependable air-cooled power . . . or any of the diversified services listed above out signature? *Whatever* your problem . . . *look to Lycoming!*

To power America's first anti-submarine carrier aircraft that's equipped for both search and attack, the U. S. Navy looks to Lycoming for air-cooled engines.*



*Wright-Cyclone engines built by Lycoming under license from Curtiss-Wright Corporation, Wright Aeronautical Division.

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Gears and Machine Parts

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Castings
Boilers

Aircraft executives please note.

ENGINEERS WANTED:
Long-term U.S. Air Force contracts for gas-turbine power plants provide unlimited opportunities for top-flight experienced engineers. Openings, too, in radial engine development for airframe, analytical, and assistant project engineers. Write Vice-President, Industrial Relations, Stratford, Conn.

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SPARTAN, *The University of Aviation,* offers a complete range of courses in all phases of the industry. 28 buildings, grounds of 50 acres, and an industry-trained faculty are your guarantee of *thorough training.* Every course, every special skill will help you to a more exciting, more profitable future. And remember, the more courses you take — the broader your foundation in Aviation fundamentals — the higher you can rise.

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now hear this . . .

PERSONNEL

Christopher Clarkson, former Civil Air Attache at the British Embassy in Washington, has been appointed U.S. representative of Vickers-Armstrongs, Ltd.

John Paul Riddle was elected President of Riddle Airlines, the company he founded in 1946.

Robert W. Henson, former commander of Navy Helicopter Anti-Submarine Squadron Four, recently was appointed chief of flight test at Ryan Aeronautical Co.

Cleemann Withers has been elected Vice President in charge of Manufacturing, Engineering and Sales of Jacobs Aircraft Engine Company.

Robert Zimmerman was named chief staff engineer for the program planning and reporting group of the weapons system division of the Radioplane Company, Van Nuys, California. **Jack Gearhart** was named senior project engineer for the company, a subsidiary of Northrop Aircraft, Inc.

John C. Weadock has been named commercial sales manager of the Bell Aircraft Corporation's helicopter division.

Robert L. Lewis, formerly assistant manager of manufacturing control at TEMCO, has been named assistant director of contract administration for the company, and **John E. Finn** has been appointed manager of industrial relations.

Brig. Gen. Pierpont M. Hamilton, USAF (Ret.), has joined the Board of Directors of Hiller Helicopters.

Air Vice Marshal Alfred C. H. Sharp, former British Air Ministry officer, has joined Martin Aircraft to assist in the study and development of foreign markets.

Dr. John R. Dunning, nuclear scientist and Dean of Engineering at Columbia Univ., has been appointed to the Technical and Engineering Committee of the Dow Chemical-Detroit Edison Atomic Power Project.

Robert Boyer, Jr., has joined LearCal Division of Lear, Inc., as Military Sales Manager. **Luther "Luke" Harris** has been made Division Manager of the Aircraft Service Division of Lear, Inc., and **Alan H. Blair** has been appointed Sales Manager of that division.

Melvin Schinkel has been named Advertising Manager of Collins Radio Co.

William M. Robertson, who recently retired from the CAA, has joined Embry-Riddle Company as Executive Vice President and Administrator of the Embry-Riddle International School of Aviation.

Ernest S. Hensley, former Assistant Regional Administrator of the CAA, Honolulu, has been made Deputy Regional Administrator, CAA, New York. **Enar B. Olson** has been shifted from his former post as Deputy Director, CAA Aeronautical Center, Oklahoma City, to Hensley's former post in Hawaii, and **Fred Novinger** has been shifted from Program Advisor, New York, to the International Region for assignment to a foreign mission. **Herbert DePue** has been shifted from Deputy Regional Administrator, New York, to Assistant to Regional Administrator, New York.

COMPANIES

Air Associates' export sale of products is now being handled by the company's newly formed International Division.

Pacific Airmotive Corporation's Chino (Calif.) Div. has been awarded a contract for the overhaul and repair of an undisclosed number of USAF transport aircraft.

Fairchild Engine and Airplane Corp. has purchased some 200 acres of industry-zoned property at Deer Park, L.I., N.Y. The site is to be the location of the new Fairchild Engine Division factory.

AWARDS

Pan American World Airways was awarded the Frye Airline Performance Trophy for 1953 for pioneering in the use of the upper air "jet stream" in regularly scheduled commercial flight.

Right Honorable Clarence D. Howe, Canadian engineer and statesman, was named the winner of the 1954 Daniel Guggenheim Medal. Presentation will be made this month at a session of the National Aeronautic Meeting of the SAE which sponsors the award jointly with the ASME and the IAS.

Bevo Howard, president of ATS and head of Hawthorne Flying Service, was made a Chevalier of the National Legion of Honor of France.

Arthur E. Raymond, vice president in charge of engineering and director of Douglas Aircraft Co., Inc., has been named to receive the Spirit of St. Louis Medal for meritorious service in the advancement of aeronautics.

Aubrey Keif, Manager of Aviation, The Texas Company, has accepted the chairmanship of the Aviation Industry Committee of the Travelers Aid Society of New York.

CALENDAR

Sept. 30-Oct. 1—RTCA Fall Assembly, Washington, D.C.

Oct. 4-6—Tenth Annual National Electronics conference, Hotel Sherman, Chicago.

Oct. 5-7—Champion Spark Plug 10th annual Aircraft Spark Plug & Ignition conference, Secor Hotel, Toledo.

Oct. 5-9—SAE National Aeronautics Meeting, Hotel Statler, Los Angeles.

Oct. 11-12—AIA Symposium on titanium, Cleveland.

Oct. 13-14—American Association of Airport Executives' 1954 conference, Univ. of Okla., Norman, Okla.

Oct. 14-15—IAS and Canadian Aeronautical Institute joint meeting, Montreal.

Oct. 17-22—Int'l Union of Aviation Insurers annual meeting, New York.

Oct. 18-22—National Safety Council, Aeronautical Section, Conrad Hilton Hotel, Chicago.

Oct. 27-29—National Business Aircraft Association Annual Meeting, Hotel Adolphus, Dallas, Texas.

Nov. 8-9—National Aviation Trades Assn. annual convention, Biltmore Terrace Hotel, Miami Beach, Florida.

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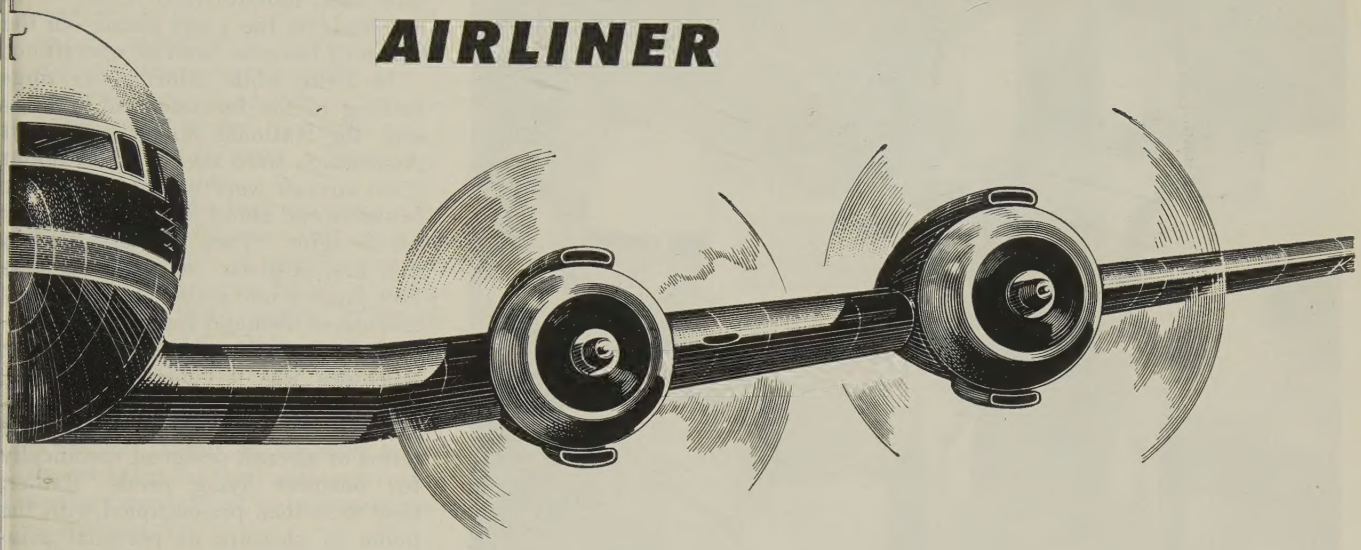
Now THE WORLD'S CHAMPION LONG-RANGE, NON-STOP AIRLINER



New DOUGLAS DC-7C

Adds 1000 miles to non-stop flight limits...

Adds up to 70 mph to cruising speed

Here is the first truly Intercontinental passenger airplane. This Douglas distance champion will carry competitive payloads up to 5000 miles non-stop . . . makes possible unrefueled flights like those illustrated...and because of its range and speed, promises to revolutionize air travel and airline operations between continents.

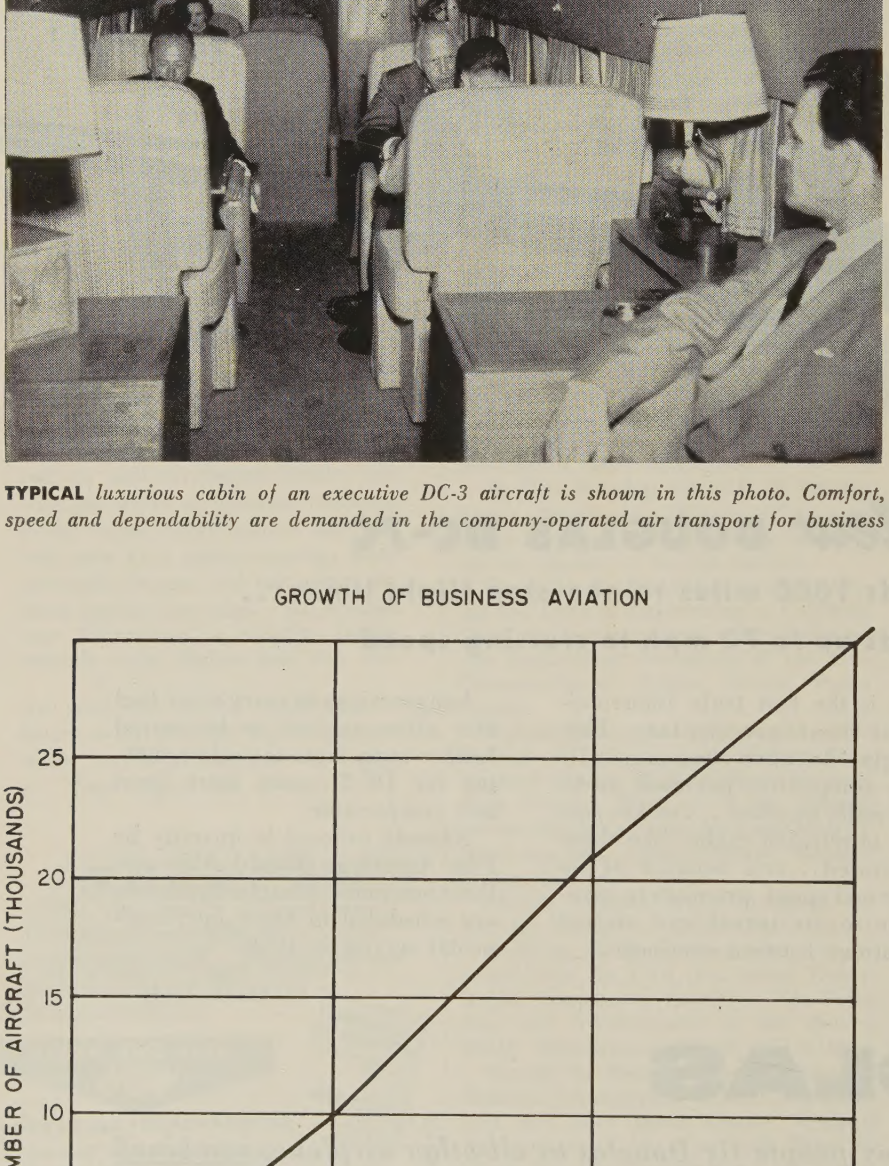
Longer wings to carry more fuel also allow engines to be moved further away from the cabin, making the DC-7C even more *quiet* and *comfortable.*

Already ordered in quantity by Pan American World Airways, these new model Douglas transports are scheduled to begin intercontinental service in 1956.

DOUGLAS

Twice as many people fly Douglas as all other airplanes combined

Business Aviation Looks Ahead



TYPICAL *luxurious cabin of an executive DC-3 aircraft is shown in this photo. Comfort, speed and dependability are demanded in the company-operated air transport for business*

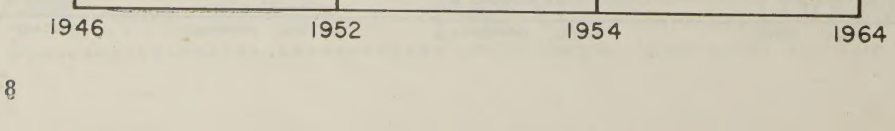


CHART *shows steady growth in the business aircraft fleet, now numbered at 21,500, plus projected estimates which place the business fleet at 30,000 or more by year 1964*

It is customary, when an organization reaches a new milestone, to review the past and to take a searching look at the future. This is such a look-back, look-forward report—with emphasis on the years ahead—in the realm of business aircraft operations.

In 1946, while informal meetings leading to the formation of what is now the National Business Aircraft Association were taking place, about 2500 aircraft were in use by and for business and about 500 of them were multi-engine types. Necessarily in that first post-war year, the business fleet pressed into service to meet busy executives' demand for fast transportation uncomplicated by rigid time schedules was a collection of war-surplus and pre-war aircraft. Manufacturers had not begun to think in terms of aircraft designed specifically for business flying needs. Rather, they were then pre-occupied with the boom in pleasure or personal aviation.

Within three years, that boom busted to take its place with the short-lived instructional flying boom-bust as another unpleasant chapter in the post-war dream that saw the skies darkened by low-cost lightplanes. The gradual decline of personal and instructional aviation only served, however, to emphasize the steady growth and inherent stability of the segment of utility aviation identified as business flying.

Without fanfare and unheralded by the seers who had predicted a rosy future for the family airplane, business aviation boomed and settled into a pattern of steady expansion unmatched in the history of aviation. By 1949, the use of aircraft by corporations and companies had become truly big business and manufacturers began to set down on paper designs of aircraft that would meet, in performance, comfort and dependability, the special requirements of the air-minded executive.

By any standard of comparison, the growth of business flying in the

Anticipated growth in utility airplane field expected to expand nation's business aircraft fleet beyond 30,000-mark in next 10 years

by Jean H. DuBuque
Executive Director
National Business Aircraft Assn.

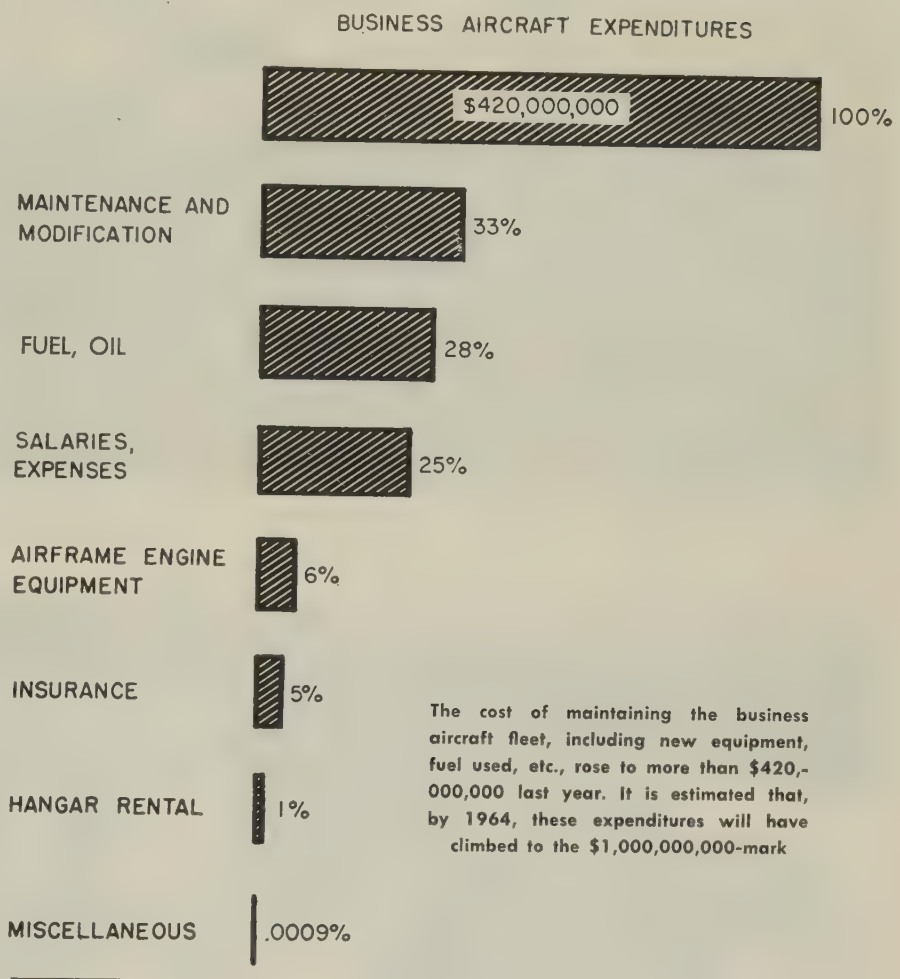
past eight years has been phenomenal. Each year has seen new records established in numbers of aircraft in use, in miles and hours flown, in passengers carried, in capital investment and in expenditures for equipment and maintenance services. This growth has been maintained without revenue, subsidies or special treatment and it will continue to grow without such artificial stimulus.

Currently, the best estimates place the number of business aircraft in use at 21,500, which is 16 times the size of the fleet operated by all domestic airlines. Of that number, it is estimated that 2,437 are multi-engine aircraft. There are more than 19,000 single-engine aircraft flying business missions and, although their utility is limited largely to daylight hours, they supplement the multi-engine fleet and are considered an essential part of business flying.

Last year these aircraft traveled approximately 903 million miles on business trips of all types and spent an estimated 6,450,000 hours in the air. This is the equivalent of flying 36,120 times around the equator and remaining airborne continuously for 736 years. At the same time, the nation's airlines flew about 525 million plane-miles on scheduled routes.

This outstanding business-flying record has been accompanied by a remarkably good safety record, one which ranks with that of the safety-conscious scheduled air carriers. It is a tribute to the high standard of maintenance practiced by business-aircraft operators and to the excellence of the professional pilots they employ. In fact, the safety record of business flying is by far the best ever attained by any segment of civil aviation outside the major airlines.

Another measure of the importance of business aviation in our national economy is the dollar. The latest survey places at more than $420,000,000 the amount spent by American business on its fleet of aircraft. The breakdown reads like this: Airframe and engine equipment, $27,350,000; crew salaries and travel expenses, $109.000,000; fuel and oil, $116,-000,000; routine maintenance and modification, $137,000,000; hangar rentals, $5,920,000; insurance on airframes, $23,340,000; miscellaneous, $375,000.



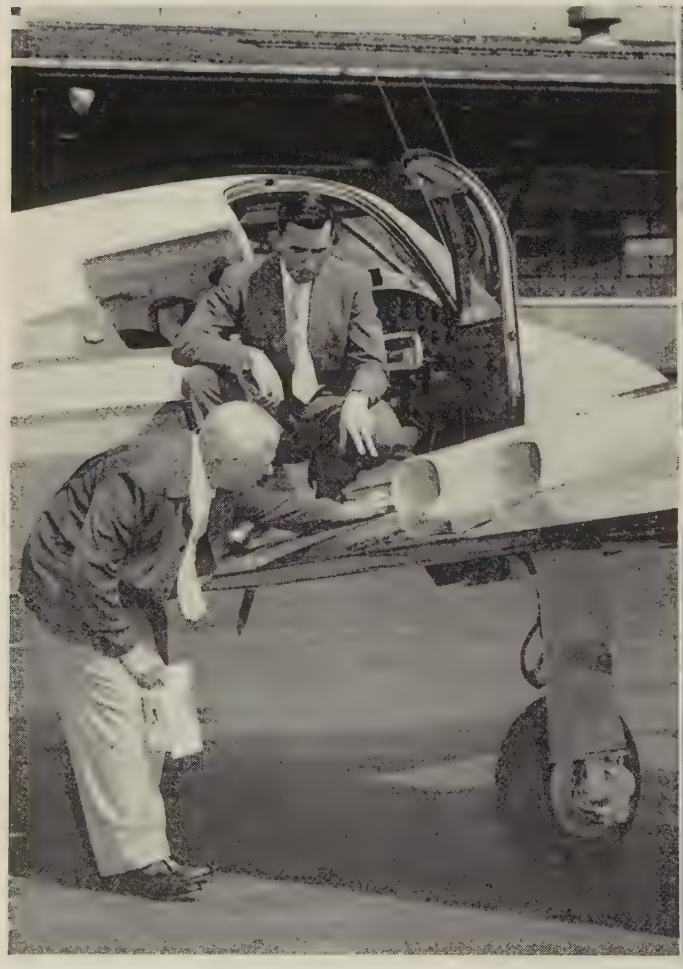
The cost of maintaining the business aircraft fleet, including new equipment, fuel used, etc., rose to more than $420,-000,000 last year. It is estimated that, by 1964, these expenditures will have climbed to the $1,000,000,000-mark

It is important to note here that the largest percentage of funds spent on aviation by American business is for maintenance and modification of aircraft. It is about 32%. A close second is the investment represented by fuel and oil purchases. Together, maintenance and modification and fuel and oil purchases account for about 60% of the money spent on business aircraft.

The close attention to sound maintenance and overhaul procedures by business-aircraft operators has injected an element of stability into the ground organizations where such work is done. Harried by the boom-bust cycles in personal and instructional flying, airport service operators are realizing more and more that they must tailor their operations for greater service to business aircraft if they are to survive. There have always been good, well-run, profitable airport service operators around the country, but their number has increased sharply in the past few years because of the service demands of the expanding business fleet. In some areas it is not unusual to find an operator recording an annual gross of $1,000,000 in the field of maintenance and overhaul services to business aircraft. Competition for this lucrative business has tended to raise the general level of these ground services, and to improve their quality and increase their variety.

(*Continued on page* 54)

CESSNA *310 is a five-place twin with 4,600-pound gross and cruising speed of 205 mph at 70% power at 8,000 feet. Useful load at full gross is 1,750 pounds. Fuel (100 gallons) for the two 240-hp Continental 0-740-B engines is carried in the 310's wing-tip tanks*



TEST PILOT *Fisher sets the mixture controls on the 310's engine control pedestal. Front seats are adjustable fore, aft, reclining*

REGIONAL *sales manager Roscoe points out to Herb Fisher that extension of augmenter tubes would create turbulence in exhaust*

COMPACTNESS *of the engines which permits utmost streamlining of the nacelles is pointed up by Fred Roscoe and Engineer E. Riggs*

flight evaluation

CESSNA 310

by Herb Fisher

Chief, Aviation Development
Port of N. Y. Authority
& Veteran Test Pilot

When a company can transfer beauty, comfort, utility, economy, safety and high performance from the mind's eye of the design engineer to the flyaway aircraft and price it right for the right market, it is, as the saying goes, in business.

Cessna appears to have done exactly that with its clean 310, a five-place twin with a gross of 4600 lbs and a cruising speed in excess of 205 mph. And, with the 310, Cessna is most certainly in business—the business-aircraft business.

Dwane Wallace, Tom Salter, *et al*, put this one together primarily for the business users, who are hungry for new multi-engine equipment in several categories, and while the paint was still bright on 310 jigs and fixtures, they announced plans for a four-engine executive transport in 1955. Obviously, Cessna has hitched its wagon to that steady, brightening star called Business Flying.

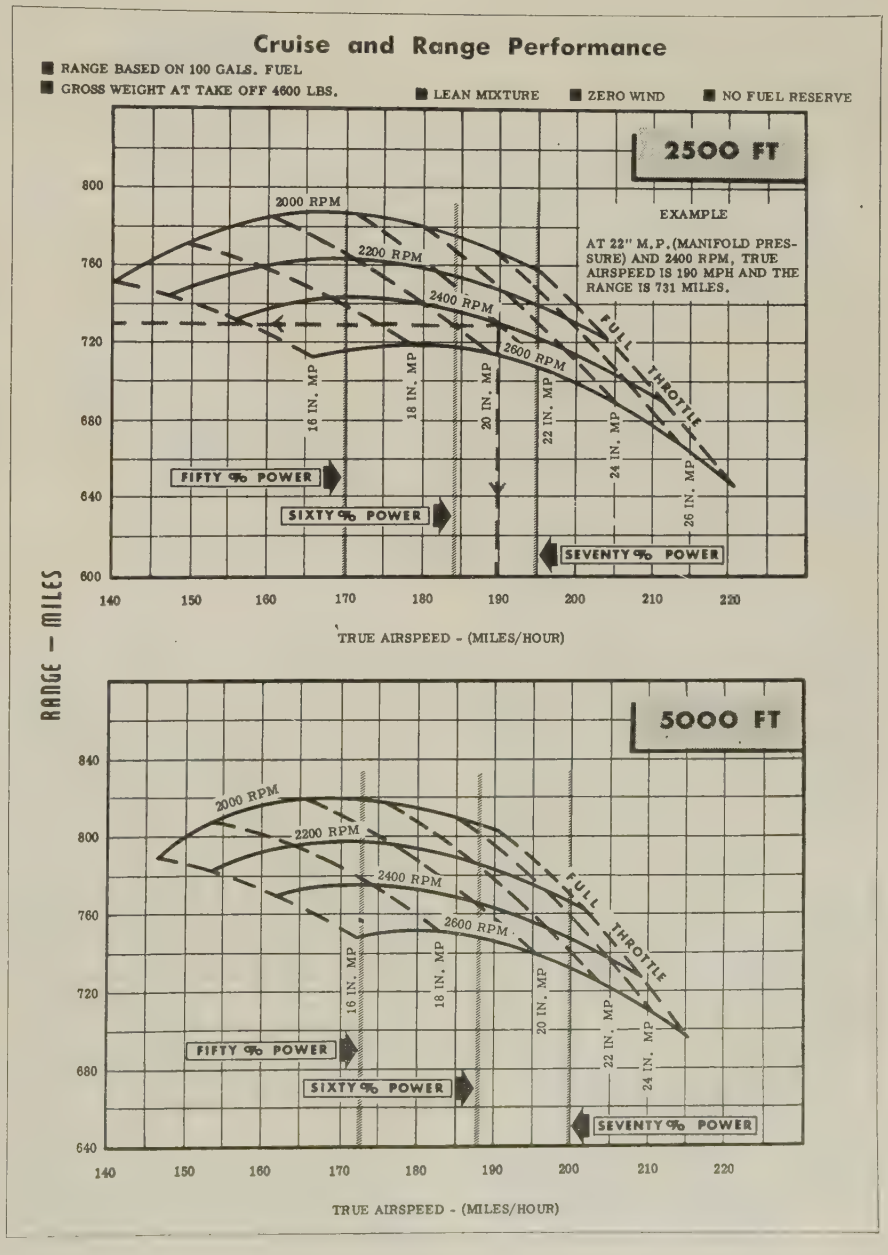
If you are a pilot, you know instinctively that certain aircraft feel right from the moment you release the brakes and begin to taxi toward take-off. The 310 is such an airplane. It feels right on the ground, on take-off, during the climb-out, operating in flight and on approach and landing.

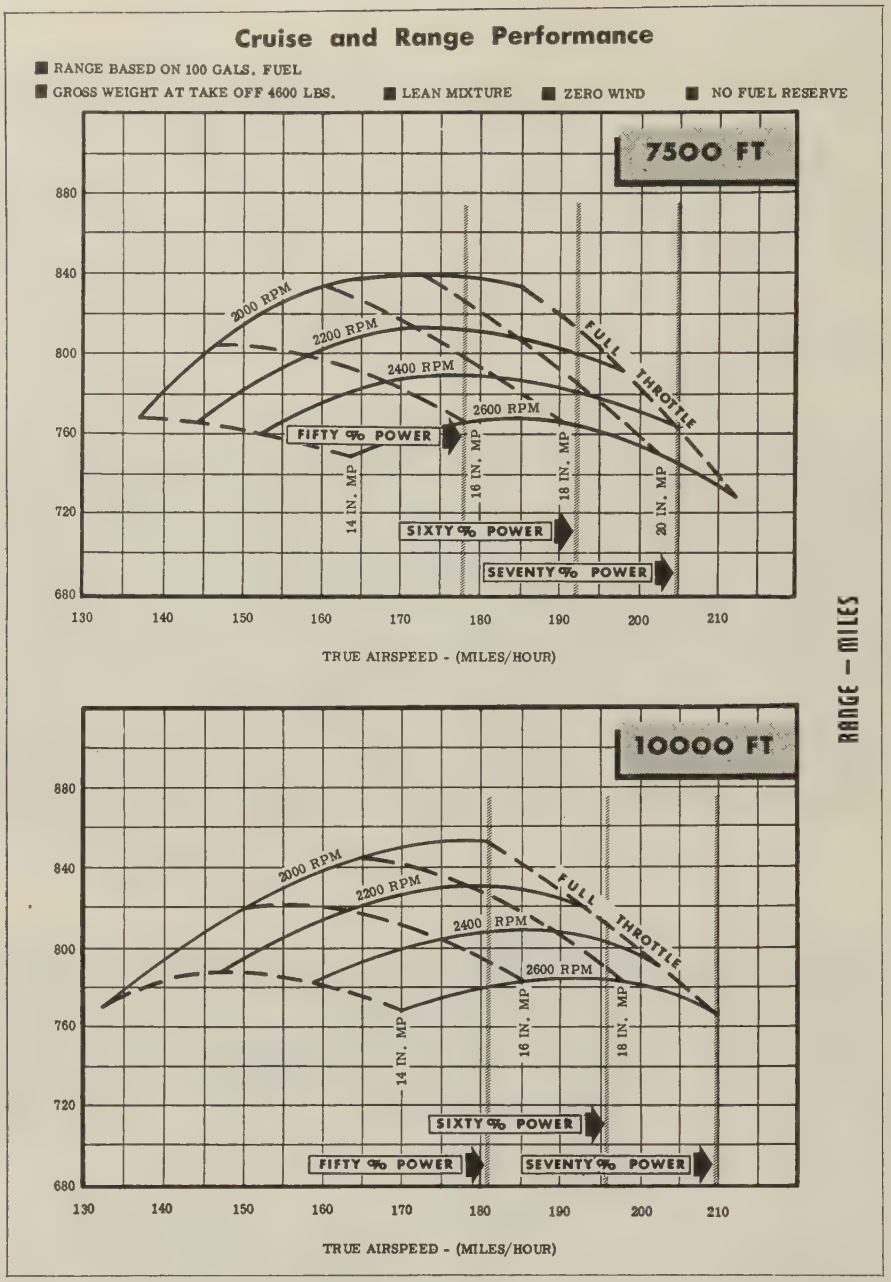
Cessna made the No. 1 production airplane in the 310 series available for this SKYWAYS' flight evaluation study, and Fred Roscoe, regional sales manager, and Earl W. Riggs, service engineer, introduced me to the sleek, brightly painted twin at Teterboro (N. J.) Airport. It sported the Bordeaux red, desert-gray, sun-white color combination, or No. 4 of the exterior color options available.

My ground familiarization tour of the 310 before we took off (interrupted by interested pilots on the field) produced a wealth of information of interest to the utility aircraft pilot and a new respect for Cessna's design and production teams.

The two six-cylinder Continental 0-740-B engines were new to me. This powerplant, originally rated at 180 hp, now develops 240 hp and in the 310 installation has a power to weight ratio of 9.6 at a gross of 4600 lbs. The power loading of 480 hp at 4300 lbs is 8.9 lbs and it drops to 8.3 lbs at 4,000 lbs.

Development of the 0-740-B which, with the fine over-all aerodynamic design of the airplane gives the 310 its superb performance, was the result of long and close cooperation between Continental and Cessna. Cessna had specified a compact powerplant to permit the utmost streamlining of engine nacelles and Continental came up with an engine that provides extremely little cross-sectional drag. The greatest depth of the 310's nacelle is 21 inches. The 0-740-B, with high-dome pistons, has a compression





ratio of 8:1. Cessna reduced cross-sectional drag, too, by mounting these engines parallel to the wing dihedral. Another convenience on this low-wing twin is that the nacelles are waist high and it's easy for maintenance crews to get at them. They don't need stilts or ladders.

The nacelles are aerodynamically clean because no cowl flaps are needed. Two large, stainless steel augmenters on each engine provide jet cooling and additional thrust. Both oil coolers are extra large. The propellers are full-feathering, all-metal, controllable, constant speed and are standard equipment on the 310.

All radio equipment is installed on racks on each side of the nosewheel well and it's easy for the average mechanic (especially a thin one) to stand up in the well. Other ease-of-maintenance features involve batteries and alcohol tanks. Cessna uses two 12-volt storage batteries which have an over-all weight less than that of one 24-volt. This makes for simplified servicing in the field. The two 12's are connected in series and are located in the wing just outboard of the left engine nacelle. The alcohol tank is outboard of the right nacelle and, like the 12-volt stand-by power batteries, is reached easily from the top of the wing. The 310 is the only light twin with de-icing equipment. Also easy to get at without tall ladders are the VHF antennae in the plastic leading edge of the base of the fin and the ADF loop in the plastic tail cone.

As a vigorous proponent of safety in flying, I was pleased to note that there is no fuel inboard of the engines. This is an important safety factor. The fuel supply is contained in two rubberized cells, one in each wing-tip tank, providing a total usable supply of 100 gallons. At the 4600-lb gross and at 10,000 feet that amount of fuel will produce a range of 875 miles at 60% of power and 1,000 miles at 50% of power. To my way of thinking, the average utility aircraft pilot wants a bit more range than that. Cessna agrees and additional full capacity is a "high priority item" in the continuing engineering program on the 310.

The fuel system of the 310 struck me as a new high in simplicity. Each tank is equipped with an electric booster pump that provides positive flow as an emergency pump in the event of failure of the engine-driven pumps. They also provide fuel pressure for priming and starting. The only time fuel flows or is under pressure between the two engine nacelles is when the cross-feed is used.

Another important feature of the 310 is the Cessna-built tricycle landing gear. Landing gear and doors are electrically operated and *Up* and *Down* switches are provided to prevent overload. They automatically stop the motors as the *"Full Up"* or *"Full Down"* position is reached. A safety switch on the right shock strut prevents operation of the *Up* circuit until the right strut is almost fully extended, preventing retraction on the ground. There is also a hand crank beside the pilot's seat in the event the landing gear motor fails to extend the gear. The nosewheel, steerable with rudder pedals up to 15° right or left of center and then free-swivel up to the maximum deflection of 55°, permits turning the airplane in a small radius.

Since I had some early experience with belly landings, particularly with multi-engine aircraft, I'd like to point out that if such a landing ever became necessary with the 310 it appears that the wing would be protected by the underside of the wing-tip tanks. I believe they'd act as skids. However, most of the weight probably would be resting on the fuselage.

I noticed, as I taxied toward the runway after my walk-around inspection of the 310, that visibility is excellent. The nose section slants away from the plexiglas window at 14° and the streamlined nacelles don't interfere with vision. At all times on the ground you can see to within 10 feet of where you're going.

My first take-off was without flaps and, with 2600 rpm and about 29 inches, we were up just as the needle passed 80 mph. Later with 10° of flap

(*Continued on page* 50)

Scheduling of Overhaul

Unless overhaul work is properly scheduled, delay in delivery of the airplane to its owner is highly probable

by Willis L. Nye

In large airline overhaul maintenance facilities where several commercial air transports are undergoing overhaul, a necessary item is an orderly schedule of completion of that overhaul. Such a schedule should embrace the requirements of manpower as well as the availability of parts to be overhauled, repaired or purchased. The same kind of schedule is applicable to the maintenance base that is in the process of overhauling air transports for company-business use.

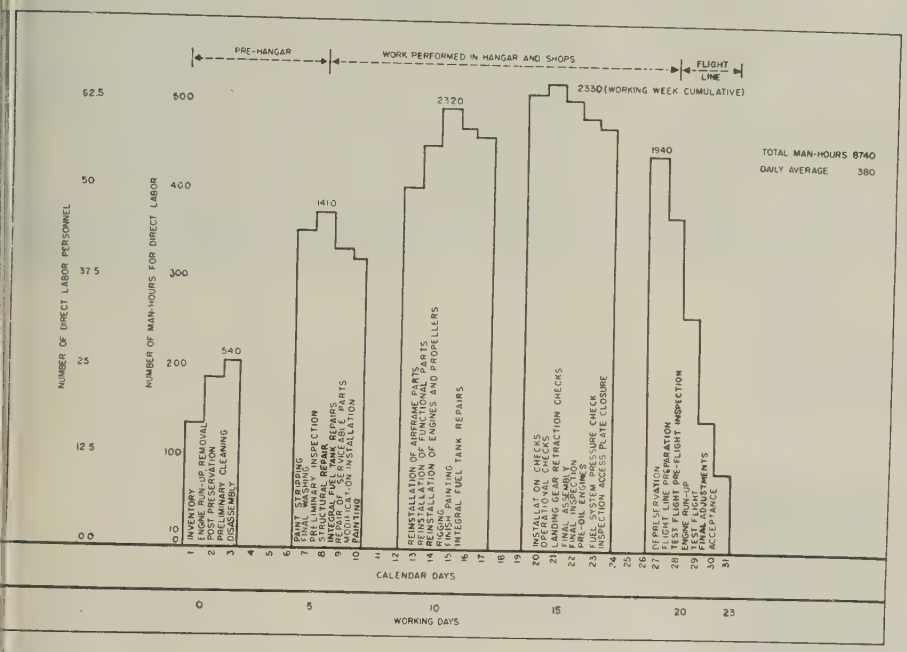


FIGURE 1—*Graphical analysis of C-54 overhaul labor distribution during each week*

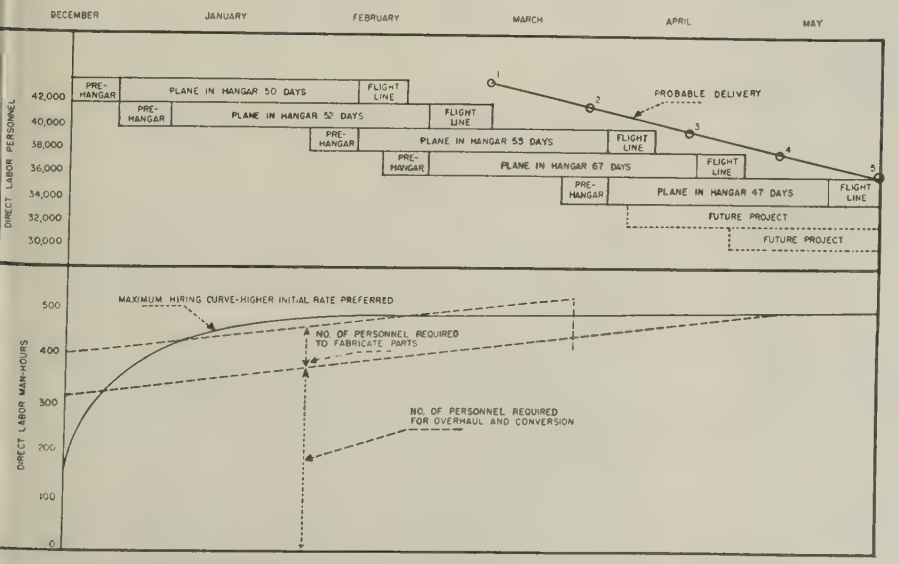


FIGURE 2—*Graph schedule for transport group conversion project, December to May*

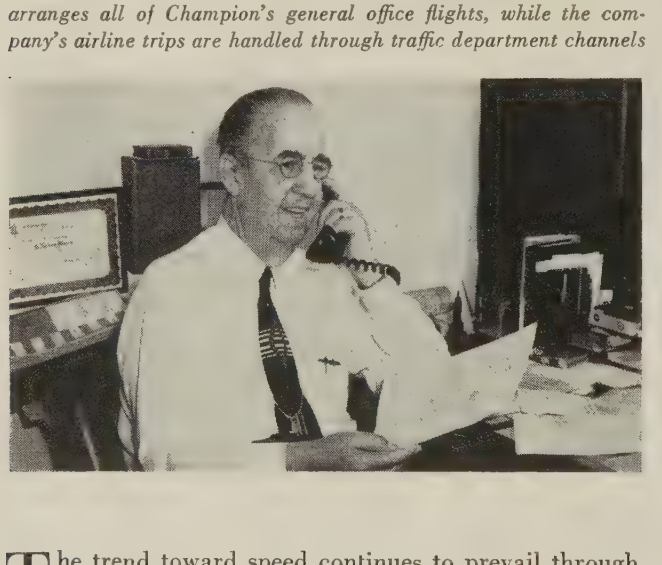
The necessity for a schedule of completion cannot be over-emphasized for either the corporate owner or the airline. Each day the airplane is out of commission represents a direct loss of income or potential income to the owner. When air transports are valued at a hundred thousand dollars—and in most instances, more than that amount—the loss on the interest on the investment alone behooves the owner to be certain that when the aircraft is sent to the overhaul base for repair, no undue delay will occur. The function of the schedule in this instance is to show the customer that, unless unanticipated delay arises beyond the control of the maintenance base, the airplane will be ready to flyaway at a certain specified date. Corporate owners should request that their representatives check the schedule to show the progress of the work to be performed when the transport is sent to the overhaul facility for repair, regardless of whether the work to be accomplished is routine inspection checks, tank sealing, or a major overhaul. Unless the work is properly scheduled, delay in the delivery of the airplane back to the owner is highly probable.

The Schedule: The component information that comprises a working schedule for the overhaul of air transports involves the supporting factors of tools required, handling equipment available, supply of parts in stock, and the available manpower. It also involves such factors as work load, holidays, weather conditions, the utilization of manpower, and the general work efficiency of the establishment where the work is to be performed. The function of the schedule is to show what is required by the shop facilities in relation to the customer's requirements. Normally, the working schedule is not submitted to the customer until it is certain that the shop facilities and manpower can comply with the scheduled date of flyaway. If the supporting factors are not available for analysis to translate into a graphical schedule, or the shop facilities are not employed in con-

(*Continued on page* 58)

DIRECT TELEPHONE LINE *links H. N. Morey (below), admin. assistant to Champion Paper's president, Reuben B. Robertson, Jr., with company office at Cincinnati Air Activities Hangar 2. Mr. Morey arranges all of Champion's general office flights, while the company's airline trips are handled through traffic department channels*

CHAMPION PAPER *Texas Division manager, Karl Bendetsen (left) checks flight with Pilot Jack Wilson at Houston (Texas) Airport. This D18, the company's first plane, has accumulated total of 7,000 hours and covered over million and a quarter miles. Champion also operates three Cessna's, a Lockheed Ventura, and a second D18*



Company Planes Aid Business

The trend toward speed continues to prevail throughout business and industry nationally, marked by a 900% increase in the use of business aircraft since 1940. Records substantiate the fact that business-owned airplanes accumulate over six and a quarter million hours of flying time annually.

Too, it is granted that business passengers comprise a predominant part of the commercial flight volume every year, with all types of craft combining to serve as aviation aids to business development. Champion Paper & Fibre Company personnel alone travel more than a million air-miles annually via commercial airlines.

Considered to be among the nation's foremost users of business planes, the Champion Paper & Fibre Company, Hamilton, Ohio, continues to expand its air travel program that was first instituted by CP in February, 1946.

Seeing the need for transporting executive and key people from point-to-point in the least possible time, Champion Paper put its first plane, a *Twin Beech*, in the air in 1946.

Finding air travel was not only an expeditious means of conveying busy and responsible administrative personnel but economical for numerous other reasons, the company followed with the acquisition of a Lockheed *Ventura*. Later, Cessnas were placed at the firm's respective divisional mills in Hamilton, Ohio; Canton, North Carolina; and Pasadena, Texas.

In May of this year, another *Twin Beech* was added to Champion Paper's fleet. Thus, a total of six airplanes are now owned and operated by the company.

Champion Paper & Fibre Company bought a D18 in 1946; today it has six aircraft

Principally, Champion Paper aircraft are employed in carrying top-level administrative personnel. However, many other operating and supervisory people also make use of air travel. Through air dispatching, Champion Paper is in a position to place qualified paper men in customer printing shops within a matter of a few hours after being called upon to discuss and analyze technical problems. Further, customers are often flown to one or more of the Champion Paper plants for meetings with company executives concerning matters of mutual interest. In making close to 7,000 flights during the years since World War II, the company planes have carried nearly 12,000 individual passengers. Over two-million air miles, representing a distance of more than 80 times around the world, have been flown by the company's aircraft since it first instituted its air travel program.

Champion Paper also recognizes the value of air accommodations in its forestry efforts, charting and photographing vast timber holdings in the Carolinas, Georgia, Tennessee and Texas. Sales, engineering, industrial, public relations and other executives within the company rely on the swiftness of aviation in carrying out their widespread manufacturing operations. Inter-divisional air travel goes on almost daily between Ohio, the Carolinas and Texas, with the transporting of urgently needed equipment not unusual.

Virtually every metropolitan airport east of the Mississippi River and scattered West Coast terminals have been frequented by Champion Paper aircraft, while company planes also have been flown non-stop to such distant destinations as Jamaica and Guatemala. The company has standing arrangements for refueling and other services from ground crews at all the major metropolitan airports.

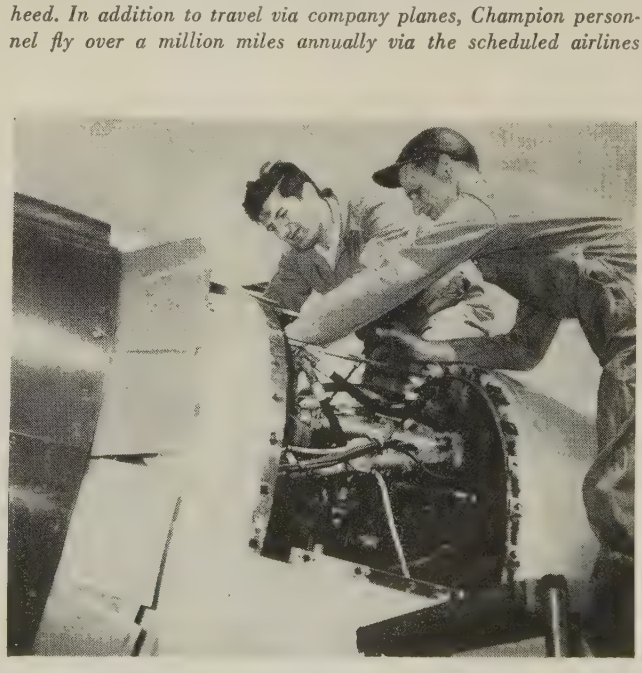
From a safety standpoint, all Champion planes are equipped with the most modern radio, navigation instruments, etc., while company policy further adds to safety by proclaiming that each airplane carry less than a full load at all times.

The Lockheed *Ventura* (N 2331) is equipped with dual VOR, ILS and ADF, a marker beacon receiver, an A-12 autopilot and a Sperry engine analyzer. *Twin Beech* N 2326 also carries dual VOR and ILS, an ADF and a marker beacon receiver, while *Twin Beech* N 80039 is equipped with a single VOR, ILS, ADF and a marker beacon receiver. The three Cessnas are similarly equipped. Seven full-time pilots, each holding either an ATR or a Commercial ticket, are employed by the company, and contract pilots, specifically, the Hogan brothers, handle operations at Champion's Hamilton (Ohio) Airport. Richard W. Smith, chief pilot, and Charles E. Hayes occupy the front office of the *Ventura;* and Joseph J. Budro and Walt Cassidy skipper *Twin Beech* N 80039 out of Lunken Airport, Cincinnati. Chief Pilot Dick Smith is also his company's NBAA representative.

Champion Paper's General Office in Hamilton maintains direct telephone connections with the company's main hangar at the Cincinnati Air Activities Hangar No. 2, Lunken Airport, while the company's divisional flights emanate from bases at the Hamilton (Ohio) Airport, the Asheville-Hendersonville (N.C.) Airport, and the Houston (Texas) Municipal Airport. H. Nelson Morey, assistant to Reuben B. Robertson, Jr., is in charge of aircraft scheduling, while Champion's airline flights come under the jurisdiction of the company's traffic department.

PILOTS *operating out of Lunken Airport, Cincinnati, are (left to right) Chief Pilot and NBAA representative Dick Smith, Charlie Hayes, Walt Cassidy and Joe Budro. Based at Canton, N.C. are pilots Harry Carroll and Walt Hoffman, while Jack Wilson is based at Pasadena, Texas. The Hogan brothers fly out of Hamilton*

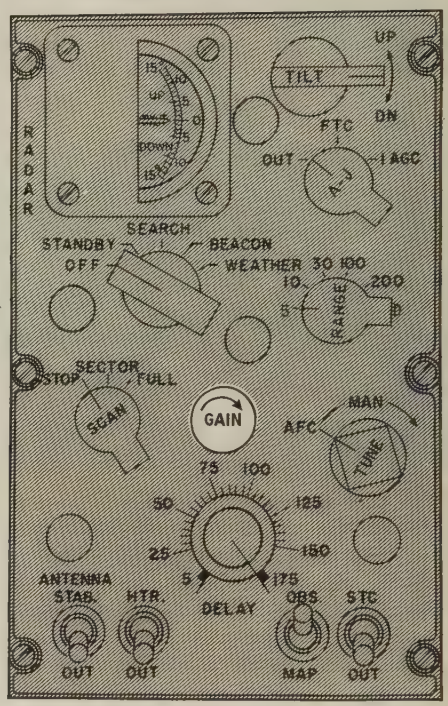
CAROLINA-BOUND, *Champion Paper's R. B. Robertson, Jr., prepares for a one-day round-trip to company's Canton, N.C. mill. Levi Long, company chauffeur, puts his boss' luggage aboard the Lockheed. In addition to travel via company planes, Champion personnel fly over a million miles annually via the scheduled airlines*



CHAMPION PAPER *mechanics, Pete Petrou (left) and Henry Luehrmann, keep a close watch over the company aircraft. Champion Paper planes get a complete engine overhaul every 5,000 air hours at Aviation Service Division, Spartan Aircraft, at Tulsa, Oklahoma. Both Champion and Spartan are members of NBAA*

FIG. 1—*Six major components of the DuMont APS-42 are synchronizer, receiver, transmitter, antenna, indicators, control box*

FIG. 2—*Control box for the APS-42 radar is installed in location convenient to the pilot. A second one also may be installed*



RADAR-VISION for TRANSPORTS

by James P. Holahan
Technical Editor, DuMont Laboratories

The weather was just on the ragged edge of minimums when the R5D four-engine Navy transport began its take-off run from the fog-bound runway of a large commercial airport. Shortly after the craft was airborne, the control tower issued instructions to turn right upon reaching 700 feet. The veteran pilot was about to comply when he looked down at a five-inch radar scope mounted above his left knee. He was strictly on the gauges, just barely able to make out the reflections of his flashing wing-tip navigation lights, but the radar screen displayed a bright return that was less than five miles to the right of the flight path. Because the radar had just been installed, the pilot was apprehensive. Was it an obstacle or was it ground or precipitation return? He contacted the tower, and requested a recheck of the right turn order, informing them of the target detected on the radar. There was a short pause, and then, "Disregard right turn, disregard right turn . . . turn left on reaching 700 feet, turn left on reaching 700 feet. Make it a left turn . . . There is a 4,000-foot ridge to the right of your course."

The error of the tower operator could have caused the transport, carrying a full load of passengers, to turn into a mountain. Had it not been for the radar, the pilot would probably not have had cause to doubt the controller's instructions. While controllers seldom make mistakes, it can and has happened.

The radar installed in this particular transport was the latest development to date in transport radar. Designated by the military as Radar set AN/APS-42, it is the first U. S. transport radar designed specifically to warn of dangerous terrain and hazardous weather. Little information on this equipment has been disseminated since, until recently, this data was on the classified lists.

The APS-42 radar was originally designed for the Navy Bureau of Aeronautics by the Houston Corporation of Los Angeles according to specifications drawn up in 1947 by BuAer and American Airlines. The joint action of the military and a civilian airline indicates the thinking behind the specs was to utilize the equipment in commercial aviation also.

Radar Set AN/APS-42 was designed to perform three functions:

1. To serve as an aid to navigation
2. To serve as an obstacle avoidance device
3. To serve as a device for detecting bad weather

The specs called for a lightweight set. This was accomplished by Houston's producing a unit that grossed 173 lbs which, in relation to similar purpose radars of World War II, put it in the low-weight category. After Houston built the prototypes, RCA, Bendix, Sperry and DuMont,

four of the top names in electronics, were called in by the Navy and Air Force, and were charged with redesigning and producing a finalized version. Of the four manufacturers, Allen B. DuMont Laboratories, Inc., is presently producing the X-band APS-42B, which is reported superior in performance to earlier models. (*Bendix is producing the RDR-1, a civil version of the APS-42 for multi-engine commercial equipment; RCA is developing a C-Band radar for airborne weather detection, and Sperry recently announced its X-band 150-lb APN-59 for the AF.*—Ed)

One of the first APS-42 installations was in former president Truman's *Independence*. Subsequently, one was added to President Eisenhower's *Columbine*. New Lockheed *Constellations*, built for the Navy, are currently being equipped with the Du Mont "B" version, and it is the intention of the military to include the APS-42 as standard equipment on all its four-engine transports.

Figure 1 illustrates the six major components of the APS-42, namely: The synchronizer, the receiver-transmitter, the antenna, two indicators, and a control box. The antenna is normally mounted in a radone in the nose of the aircraft. One indicator mounts to the left of the pilot, the other is placed either at the right of the copilot or in the navigator's compartment. The control box is installed in a location convenient to the pilot, and provisions can also be made for the installation of another control box either at the copilot's or navigator's position. Both the synchronizer and receiver-transmitter can be placed in a remote location in the forward section of the aircraft. The antenna wave-guide components and receiver-transmitter are pressurized to maintain an internal sea level atmospheric pressure up to an altitude of 50,000 feet in order to permit satisfactory operation of the high voltage and radio frequency circuits.

The antenna scans an area of 360° when the scan switch of the control box (see *Figure 2*) is turned to "Full," and 120° in the "Sector" position. In normal antenna installations (antenna in airplane's nose), the 120° sector in the rear of the antenna is blocked out to the radar beam by the fuselage. In order to prevent the fuselage from reflecting any echoes when the antenna is set to "Full" scan, the aircraft structure immediately behind the antenna is coated with a material which will absorb electro-magnetic radiation and appear to the radar as free space. This prevents any reflections from this source

(*Continued on page* 34)

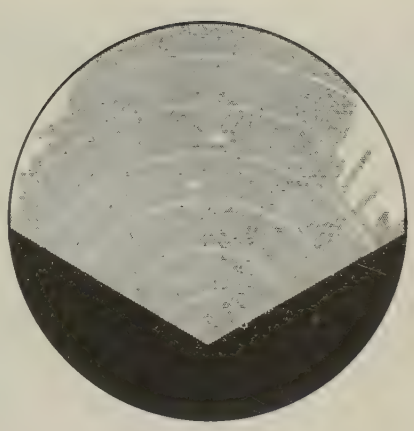


FIG. 3—*When "offset sector" type of scanning (above) is selected, sweep origin is offset toward bottom of indicator to permit display of greater search-area detail*

FIG. 4—*This is an indicator display of a relatively flat terrain. Note that the presentation has the appearance of a relief map illuminated by a rotary searchlight*

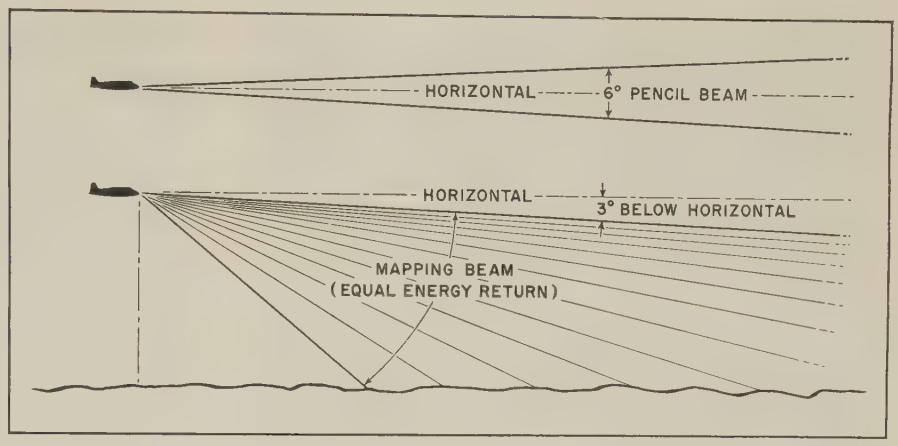


FIG. 5—*While mapping beam of the APS-42 is fan-shaped, the pencil or obstacle beam is directed outward and is narrow. Very little ground return is picked up from this beam. By tilting the antenna, the radar picks out the elevated or airborne objects that are intersected by the pencil beam. Mapping beam extends 40° below aircraft's line of flight*

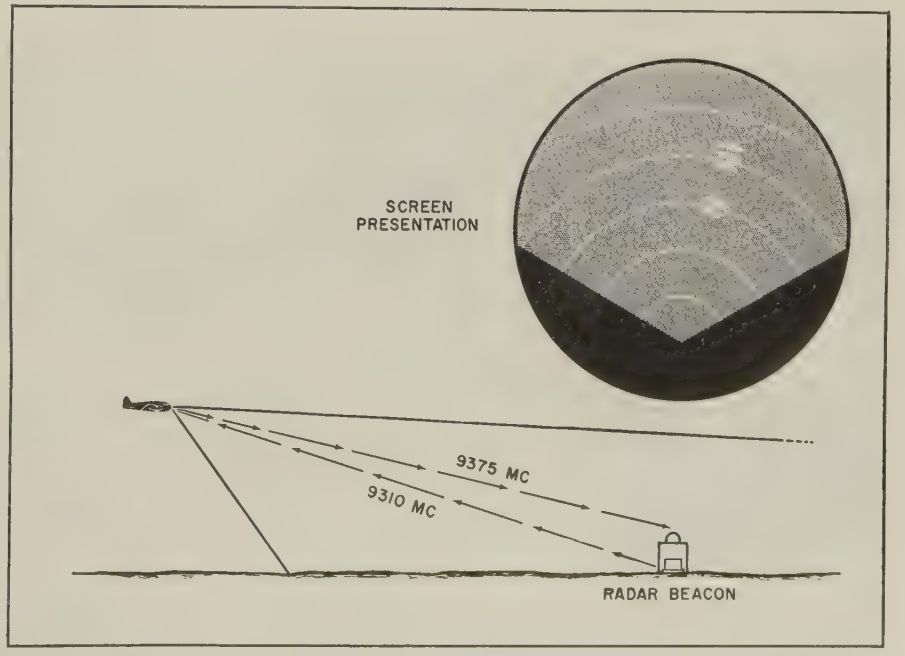


FIG. 6—*Another method of navigating with APS-42 is by means of ground racon stations. The radar will receive and display coded identification signals from ground radar beacons*

SKYWAYS FLIGHT OPERATIONS ROUND TABLE

OCTOBER 1954 *Wings Club, New York*

"Business Pilot Proficiency"

Discussion proves pilots in agreement on fact that proficiency includes their ability as businessmen as well as to fly safely

Moderator Wm. P. Person (*Mgr., Air Transport Div., Flight Safety Foundation*): "Business pilot proficiency is our subject for discussion at this meeting. Investigation has disclosed two schools of thought: one group believes in a regular training and check program, done either by themselves or by a professional organization specializing in that type of work. The second group feels that, due to their everyday flying, they are able to keep up their own proficiency and maintain their standards. Undoubtedly, there are pro's and con's on both sides.

"From Flight Safety Foundation's point of view, a business pilot is a professional man and, therefore, has a very high standard to maintain. He should keep current regarding the latest developments and techniques, and it takes the best of co-ordination to keep informed on them. I am certain we would not consult a doctor if we thought for one minute that he failed to keep up with his profession and did not take refresher courses occasionally. A pilot has the same responsibility to his boss.

"Nev Watson, would you lead off the discussion?"

N. E. Watson (*Chief Pilot, C. V. Starr & Co.*): "There definitely is a need for training by professional instructors instead of relying solely on your own ability to keep proficient in all phases of operations. However, I don't believe that covers all our troubles. It's too easy to take a refresher instrument course and then feel that it alone answers the problems. I think it was in one of your publications, Bill, that Flight Safety Foundation came out with a treatise on judgement. The article brought out the fact that pilots are paying more attention to technique and less to judgement. That is a problem that merits consideration."

Bill Person: *"When we say 'pilot proficiency and training,' it covers more than just an instrument check. It is a program that also includes meteorology, navigation, aircraft performance, etc. Perhaps through proper training, judgement can be developed."*

William R. Strong (*Chief Pilot, Nat'l Dairy Products*): "Of course, I agree with the necessity of a proficiency training program, but I feel that as time goes on repetition reduces the value of the basic training. After several years of six-month checks, for example, perhaps the crew

PILOT PROFICIENCY *Round Table participants included (left to right around table) N. E. Watson, C. V. Starr & Co.; Rip Strong, National Dairy Products; Jean DuBuque, National Business Aircraft Association; Gerald J. Eger, International Harvester Co.; John Chamberlain, Bureau of Safety Regulations, CAB; Capt. Kim Scribner, Pan American World Airways; John Lambert, U. S. Rubber Co.; Harley Kysor, Aviation Consultant, Liberty Mutual Insurance Co.; Howard Pember, The Texas Co.; Bill Person, Air Transport Div., Flight Safety Foundation, who served as Moderator, and Al Ueltschi, president of Flight Safety, Inc.*

"TRAINING *is necessary," said Rip Strong (left), "but a crew should stress emergency procedures, not run-of-the-mill things"*

"METHOD *of training also is important," stated Capt. Scribner (center). "We have new equipment and need new techniques"*

should stress emergency procedures. These procedures are not run-of-the-mill in the general operation of aircraft. Therefore, the crew should lay more stress on that phase of flying rather than on something that is a part of the daily operations routine.

"Also as a part of a proficiency course, all types of navigation should be practiced, even celestial. Maybe you'll never use it, but it broadens your knowledge of the subject considerably and you never know when it might come in handy. Perhaps such a program should also delve into maintenance. A lot of pilots don't know where 800 pounds of pressure comes from on the gauge. Our NBAA Flight Safety Committee intends making maintenance a part of flight training."

Jean DuBuque (*Executive Director, NBAA*): "Pilot proficiency is a continuing problem in business aircraft operation. NBAA recently conducted a survey to determine how many of its members engage in periodic pilot proficiency training. We discovered that the majority have some type of program that helps to keep their pilots abreast of the latest flight techniques and procedures. We also learned that most of our members periodically employ the following proficiency training methods: a) flight checks, b) Link training, c) refresher courses from qualified training organizations, and d) organized training programs under the supervision of the chief pilot.

"A highly important factor in any successful business-aircraft operation is flight completion. The value of an airplane to a company and the expense of its operation is justified only on the basis of maximum utilization. Therefore, the flight crew must have and be able to demonstrate proficiency. This can be accomplished only through a consistent program of training to assure safety of operation, close teamwork between pilot and copilot, and the ability to apply the necessary techniques and procedures to cope with any flight situation.

"Professional business pilots must necessarily have thorough knowledge of their jobs and fully recognize their responsibilities. They must possess, above all, sound judgement, the ability to make correct decisions and take proper action in a short period of time under emergency conditions."

Gerard J. Eger (*Sec'y, International Harvester Co.*): "We have always felt that pilot proficiency and training are of paramount importance in aircraft operation.

"The business pilot probably carries more so-called top-level people over a given period of time than an airline pilot does. The safety of those businessmen is vital to the operation and continued welfare of a business. Put a lot of top-level executives of any one company, such as International Harvester, General Motors, General Electric or any of the oil companies, in one airplane, and if something happened to that airplane, it could jeopardize the continued existence of that company. For that reason we feel that pilot proficiency is of great importance. We tried to run our own training program, but it interfered with our scheduling of the airplane and, therefore, was impractical."

Bill Person: *"Capt. Scribner, you've been doing some work on a photographic means of qualifying pilots at various airports. Would you give us your thoughts on that?"*

Capt. Kimball Scribner (*Chief Pilot—Atlantic Div., Pan American World Airways*): "We are not only concerned with pilot proficiency, we are also concerned with methods of training. New types of equipment are continuously being made available to us, but perhaps we have been derelict in not applying ourselves to the same line of thinking in improving our training technique.

"With that basic problem in mind, we have experimented over the last nine months in the development of a method of training or qualifying pilots to operate into airports. Our method is a bit different from anything that has been done before. We use a wide-scope projection of film.

"We took pictures out the front of a DC-3 of the various approaches to LaGuardia Field. Then, by interviewing such people as the airport manager, the chief control tower operator, chief of the ATC center, and the meteorologist, we accompanied the film with an oral briefing and literally invited the audience to come along with us in the DC-3 and make the various approaches. We also related the outbound patterns consistent with the noise abatement program of the NATCC.

"We have shown the film as a project to the CAA and CAB and a cross-section of the industry, and we are very encouraged by their reactions. We have hopes of building a library of films for all airports.

"Under current regulations, a pilot is qualified to go into an airport if he makes an instrument approach on some rainy, hazy night and has a check pilot aboard. We think we can do a much better job of it by utilizing this film technique."

Bill Person: *"American Airlines also has been working on some ideas along the lines of your film presentation, Kim. There certainly is no question that something like that definitely is in order. It will give the pilot a much*

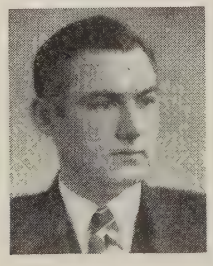
"BEST SAFETY DEVICE *in a plane," said Al Ueltschi (left, seated next to J. Lambert), "is a well-trained pilot with common sense"*

"WELFARE *of a company's top personnel," said Bill Person (right), "hence, safety, is business pilot's prime responsibility"*

better picture of the airport. As we know, a pilot can qualify at an airport while riding a trip into the airport, even though the weather may be 200 and ½.

"Harley Kysor, let's have your views."

Harley Kysor (*Aviation Consultant, Aviation Bureau, Liberty Mutual Insurance Co.*): "Liberty Mutual's approach to the subject of business pilot proficiency is somewhat different. First, let me state that we heartily endorse a complete and regular training program for all flight crews—private, business, or airline pilots. However, while we do feel that the pilot technique required to fly an airplane within certain limits of airspeed and altitude on a six months instrument refresher is of great importance, we do not feel this physical ability is, by any means, an adequate and true measure of a man's capacity as a pilot. Rather, our Loss Prevention Department has proven in servicing hundreds of thousands of accounts for over 40 years in all types of industry that there are many and varied elements that make up a person's capacity in a particular profession. Therefore, in order to develop any pilot's capacity to its fullest extent, consideration must be given to such factors as the physical condition of the pilot, working conditions, type of aircraft and related equipment being utilized, management's policy toward the aviation department, and many others. It is highly desirable that all factors that in any way affect an aviation department from the standpoints of management, operations and maintenance be closely evaluated before inaugurating a training program for increasing the capacity of the pilots. It is only through a thorough knowledge of all these factors that an efficient and effective pilot proficiency program can be designed to meet the needs of the particular operation concerned. Such a program must be designed so that it will increase (*Continued on page* 40)



ROUND TABLE PARTICIPANTS

WM. P. PERSON, moderator of pilot discussion, is former American Airlines pilot. He is now Manager of Air Transport Division, Flight Safety Foundation.

JEAN H. DUBUQUE, Executive Director of National Business Aircraft Association, has been active in aviation for more than 20 years. He is a member of IAS, QB's.

NEVILLE E. WATSON, Chief Pilot of C. V. Starr & Co., Inc., has been an executive pilot since 1946. He is a former instrument flight instructor for PAA.

CAPT. KIM SCRIBNER served with the Air Transport Command during the war. He joined Pan American in 1942; became a captain in '44; Div., Chief Pilot in '51.

HOWARD W. PEMBER, Captain, The Texas Co., is a former American Airlines captain and instructor. From 1938 to 1941, Mr. Pember was a fixed base operator.

JOHN C. LAMBERT, Chief Pilot of U. S. Rubber Co., has been flying 23 years. A USAF pilot during war, he was member of RAF Ferry Command, 1941-1942.

A. L. UELTSCHI joined Pan American in 1940 and today is head of Pan Am's executive transportation department. He organized Flight Safety, Inc., in 1951.

HARLEY D. KYSOR was ground and flight instructor, USAF, during war; became a business pilot in 1946; today is aviation consultant as well as an EAL capt.

G. J. EGER was elected Secy. of International Harvester in 1948; served with AF during war. He is member of Board of Directors, Nat'l Business Aircraft Assn.

WILLIAM R. STRONG, Chief Pilot of National Dairy Products Co., Inc., joined the company in 1945. He is also Chairman of the Safety Committee of NBAA.

JOHN CHAMBERLAIN has been Director of Bureau of Safety Regulations, CAB, since '47; joined Bureau of Air Commerce in 1936. He is a licensed pilot.

Performance PITFALLS

from the Files of the Flight Safety Foundation

by Jerome Lederer and Robert Osborn

LET US NOT BE DAZZLED

Perhaps air transport in its present form should be regarded as a measure of our ambition rather than our achievement. Let us not be too dazzled by statistics; after all, tightrope walkers do not often fall off the wire. Too often it seems that a kindly Providence, rather than our own efforts, gets us out of serious trouble. The airplane of today is a transport vehicle of enormous potential; but there must be a period of consolidation of effort devoted to making the vehicle more reliable, and less exacting on the people who fly and maintain it. We have come a long way, there is no discredit in taking a breather. The attitude we should adopt seems to be summarized in the words of Macbeth, "*To be thus is nothing, but to be safely thus.*"

GUST LOCKS

A number (too many) of fatal accidents have occurred because:

1. Gust locks were not removed or released prior to take-off.
2. Pilot did not check controls through full range prior to take-off.

Some new airplanes have clever arrangements which make it impossible to push throttles ahead for take-off without first releasing gust locks. This, too, can be a trap to the over-confident pilot because ice, of which he is not aware, can lock the controls. The following is from our bulletin of September 18, 1947:

"A pilot checking controls at take-off found ailerons and rudder free, elevator locked. Gust locks were off. Ice had formed on a pulley forming part of the gust lock, locking the elevator."

Trim tab position should also be checked prior to take-off because tabs in extreme wrong positions on take-off can adversely affect a captain's ordinarily sweet disposition!

Gadgetry is helpful, but personal attention to detail can never be eliminated.

AUTOMATIC LIGHTS FOR NIGHT CRASHES

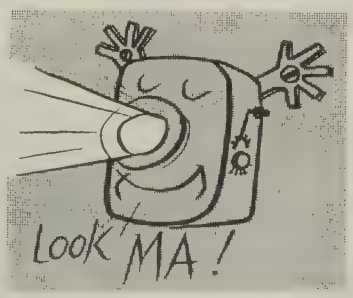
A crash at night carries with it the problem of adequate illumination of exits, aisles and emergency equipment to facilitate escape. For example: "The left wing struck a snow bank, causing the plane to skid into the piled snow in a nose-down position. The right main gear collapsed, the fuel tanks ruptured and fire broke out around the right wing. Emergency exits and equipment could not be located in the darkness." (Fortunately only five passengers were injured, 25 uninjured.) There have been cases where the only illumination was provided by the gasoline fire!

Several airlines have installed inertia-operated switches which turn the lights on by deceleration. The electrical circuits should be independent of the usual sources of current and should be protected against disruption in a crash. The independent battery for these lights should also be in a protected location, held firmly against high G loads (at least 10). It should also be installed high in the ship to be above the water line in a ditching (land-operated planes are vulnerable to ditching at many airports adjacent to bodies of water).

The B. K. Sweeney Manufacturing Co. of Denver, Colorado, makes the inertia-operated flashlights used for several years by United Air Lines. These can be set from 2G's to 9G's. They are modifications of ordinary flashlights.

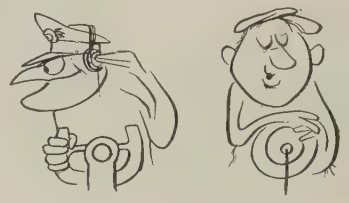
The Venner Co., Ltd., New Malden, Surrey, England, has developed a special Inertia Switch Lighting Unit which is soon to be fitted on the *Comets*. These can be set from 1½ to 4½ G's. A tiny special silver-zinc rechargeable battery gives one hour's light at 1.5 volts, one ampere hour. Weight is 12½ oz.

Several airlines have installed two large-type dry-cell operated "lanterns"—one at



each end of the cabin. These are to be turned on by cabin attendants when an emergency occurs. With larger cabins and partitions, more than two of these lights will be necessary. One airline (Colonial) is foresighted enough to require these lights be turned on prior to *every* night take-off and landing, turned off in cruising flight. The lanterns are made by Safety Light, Inc., Washington, D.C.

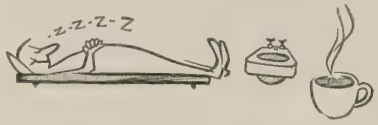
These solutions to illumination in crash landings at night should encourage other operators to adopt them in the interest of passenger safety.



RE-EVALUATION OF ENROUTE WEATHER

An airline pilot calls our attention to the relative complacency with which many pilots look upon enroute weather—the emphasis now being on weather during landing. The higher cruising altitudes and cruising speeds have tended to create a more tolerable or contented feeling towards enroute weather than existed a few years ago. Complacency is an easy habit. It is difficult to maintain alertness and a sense of adequate caution towards something that has not happened for a long time. But this is the difference between a professional captain and a tram driver.

There is also a noticeable trend, the pilot added, to forget the critical speeds at which gear and flaps should be lowered, especially when encountering turbulence during enroute cruise. And on this matter of turbulence he reminds us that a bump that was thought severe in a DC-3 may hardly be felt in modern airplanes because of their higher wing loadings—the pilot may be hitting air a lot rougher than he thinks it is; advance preparation (slow down) for gusts where possible is a partial antidote to this possibility.

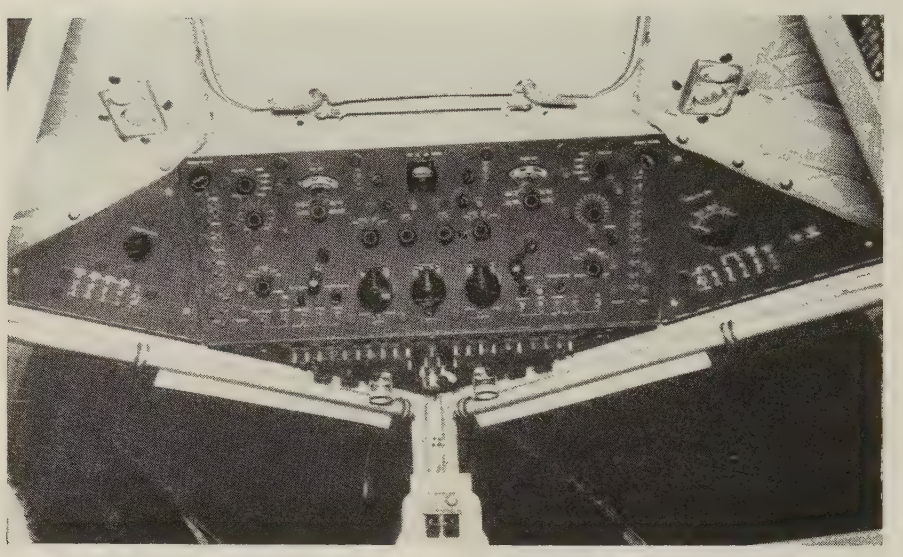


FATIGUE

Another airline pilot writes, "I was interested in your item on Fatigue in APB 53-6 and quote: 'It is combatted by . . . hot food every four hours.' I have found on flights of long duration that the next to last hour should be spent getting refreshed for the final period, which includes traffic, approach and landing and may include the decision as to whether to divert or not. A short nap, if spare time is available, followed by washing the face, and a cup of coffee will leave a captain refreshed for his most critical period of operation."

SKYWAYS FOR BUSINESS

NEWS NOTES FOR PILOTS, PLANE OWNERS OPERATING AIRCRAFT IN THE INTEREST OF BUSINESS



MASTER RADIO *control panel for DC-3 and Lodestar centralizes radio and electronic controls*

Aerodex Custom-Designs Master Radio Control Panel for DC-3's

Miami, Fla. A master radio control panel to centralize in one ideal location (forward and above the pilot and copilot) all the controls necessary for the operation of radio and electronic equipment aboard DC-3 and *Lodestar* executive aircraft has been custom-designed by Aerodex, Inc.

All parts are mounted and wired on a .064 gauge aluminum sub-panel, and controls and switches are brought through a 3/16th plastic front panel with a specially prepared black surface machine-engraved to indicate the function of each control. Thirty-nine small panel lights edge-light the plastic so that the only visible light is that shining through the engraving. Brightness of this light is controlled by a rheostat. Panel lighting is red, the preferred color for night-flying operation.

Individual volume controls are provided for each receiver, plus pilot and copilot master volume controls which set the level at each pilot's headset or cockpit loudspeaker.

Vertically, along each side of the panel are located the audio selector switches that select and control the output of the Bendix MI-32 isolation amplifier. This unit makes it possible for the pilot to select any combination of receivers or other audio signals he wishes to listen to, completely independent of what the copilot selects.

A Bogen HE-10 PA amplifier provides public address announcing from cockpit or cabin as well as providing audio amplification for the Craftsman RC-10 AM and FM radio tuner which is heard through four cabin speakers concealed above the headliner of the cabin. Separate pilot and copilot microphone selector switches permit either the pilot or copilot to select any transmitter as well as intercom and PA announcing systems.

HF communications is provided for in the 20-channel Collins 18S-4/18OL transceiver. VHF communication is via the Collins 51R-3/17L receiver-transmitter combination. Two ARC T-11B transmitters are standbys. In addition, the installation incorporates the Integrated Flight System, two separate Collins 51R-3/51V omni and ILS', two Bendix MN62 ADF receivers, RMI indicators, Sperry Zero Reader and C-4 Gyro and A-12 Autopilot. A Bendix MN61 provides both visual and aural reception of marker beacon transmission.

Super Widgeon Now Approved With Three-Bladed Props, New Engines

New York, N. Y. The Grumman *Widgeon,* a versatile amphibian operated as a business plane by many companies, recently received another boost in performance. This time the improvement is brought about by the new Hartzell three-bladed propeller, similar to those now being installed on new Aero *Commanders.*

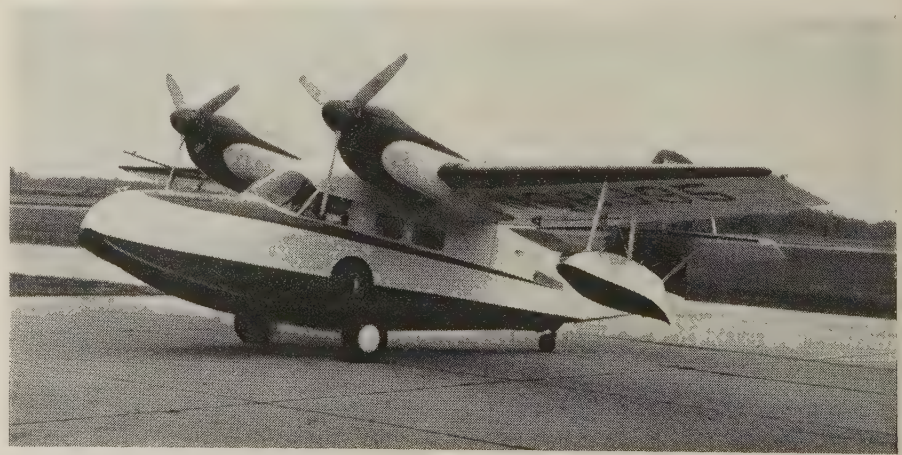
The McKinnon-Hickman Company recently received approval on the Hartzell Model HC83x20-2A/8433 three-bladed prop and the new Lycoming GO-480B 270-hp engines. While the additional horsepower adds to the performance of the McKinnon-Hickman *Super Widgeon,* it is the new propeller that offers the big improvement. The third blade provides extra prop efficiency and the additional flywheel effect makes this installation exceptionally smooth. Also, shorter blades cut down on tip speed and, since the blades are working further away from the cabin, prop noise is reduced. This, coupled with the McKinnon-Hickman over-wing exhaust, makes the installation very quiet. Again because the blade is shorter, the prop works in less spray on water take-offs, and this cuts down propeller maintenance. It also largely eliminates water spray on the windshield at the beginning of a take-off.

With a cruising speed of 160 mph at 65% power, a land take-off in 600 feet, a water take-off in 10 seconds and excellent single-engine performance, the *Super Widgeon* is now serving as a highly useful and extremely practical executive transport.

Since the McK-H Co. introduced their original conversion, some 29 *Widgeons* have been converted to Lycoming engines and Hartzell props. These now are in operation throughout the United States, Canada and Alaska.

Natural Gas Pipeline Co. Gets Out New Air Manual

Chicago, Ill. A new Aviation Division Manual covering all operational phases of the firm's aviation activities has been announced by the Natural Gas Pipeline Company of America. A 42-page book, it in-



SUPER WIDGEON *is now CAA-approved with GO-480B engines and new three-bladed props*

cludes duties and responsibilities of Aviation Division employees, operating regulations, aerial patrol procedures, employment qualifications, divisional policies, aircraft maintenance, training and proficiency regulations, weather regulations, emergency regulations, accident procedures, insurance coverage, air travel accident insurance, purchasing procedures, and reports and records.

Headed up by Harvey Glass, the division operates five aircraft for pipeline patrol and passenger service.

Chicago Tribune Adds Convair 340 to its Business Air Fleet

Chicago, Ill. The Chicago *Tribune* has added a Convair 340 to its fleet of business aircraft that serve officers and directors of the Tribune Company, the New York *News*, the Ontario Paper Co., the Quebec North Shore Paper Co., and the Quebec and Ontario Transportation Co., Ltd. Originally built for Northeast Airlines but never delivered, the 340 was purchased last May and flown to AiResearch, Inc., at Los Angeles International Airport, where a special cabin interior and a complete communications and navigation system were installed. Cabin layout provides seats for 14 passengers.

The Convair supplements two six-place Aero *Commanders*, two Grumman *Mallards* and two deHavilland *Beavers*.

Johnson Wax Company Purchases Twin Beech for Business Use

Racine, Wis. A pioneer in the use of company aircraft for transporting personnel on business trips, the Johnson Wax Company recently purchased a *Twin Beech* for this purpose. Back in 1929, the company operated a single-engine plane which was known as the "Johnson's Wax Wing." In 1935 in a company-owned twin-engine Sikorsky amphibian, H. F. Johnson, president of the company, led an aerial expedition to Brazil to study the Carnauba palm. In more recent years, however, Johnson personnel have relied on public carriers.

Pilot of the Johnson *Twin Beech* is Harold Sumi, former commander in the Naval Reserve, who has had more than 5500 hours of flight time. The D18 is based at the Horlick-Racine Airport.

JOHNSON CO's *D18 pilot is Harold Sumi*

. . . . in the business hangar

Reading & Bates, Inc., Tulsa, Oklahoma, has equipped its company *Twin-Bonanza* with a Flite-Tronics CA-1 audio distribution amplifier. The installation was made by Aerotron Radio Company in Tulsa.

American Cyanamid has its Grumman *Mallard* N-2990 at Mallard Industries, Bridgeport, for a sanding and paint job atop the wings. Chief Pilot and NBAA representative for American Cyanamid is Bill Shaughnessy.

Seneca Falls Machine Company's new D18 Beechcraft is flying again after installation of a complete Collins and Bendix radio system, and a Lear L-2 Autopilot. Work was done in Rochester, N.Y. by Page Airways.

The Kroehler Manufacturing Company, Naperville, Ill., has purchased a *Lodestar* that is presently at L.B.S. in Miami, for executive conversion. Kroehler bought the airplane in Fort Worth and when it was flown to Miami, it was discovered that it was a *Lodestar* formerly owned and operated by Aerodex, an L.B.S. subsidiary. Chief Pilot and NBAA representative for Kroehler is Robert L. Hanson; his copilot and maintenance chief is Arthur Vesley.

Joe Boyle, pilot of the Natural Gas Pipeline *Twin Beech*, and his copilot Marion Dow brought the D18 to Northwestern Aeronautical at Holman Field, St. Paul, Minn., for a double engine change, 1,000 hour inspection and installation of a main inverter in the right nacelle.

A Lear L-5 Autopilot and two specially designed cabinets housing cabin radio, dictating machine, thermos bottles, hot cup and storage space are being installed in the Hunter-Douglas Corporation's *Twin Beech* by Lear Aircraft Service, Santa Monica, Calif. Home base for the H-D Corp is Riverside, Calif.

Crockett & Gambogy expect to take delivery soon on their PBY that is at Grand Central Aircraft Company for 100 hour inspection and re-license. An engine change also is in order, according to Crockett & Gambogy's chief pilot, W. C. McAfree.

Russ Ammon, president of the Marion Electrical Instrument Co., Manchester, N.H., flew his Aero *Commander* to Teterboro Airport for installation of a NARCO DME in the Atlantic Aviation shop.

Shelby Maxwell, Chief Pilot and NBAA representative for Burlington Mills Corp., Greensboro, N.C., brought his company's Super-92 DC-3 to Remmert-Werner for its first engine change. Burlington also operates two D18's and a *Navion*, all based at Greensboro.

Dick Pinkerton, Eastern States Petroleum's chief pilot, has his company's *Lodestar* back in the air after installation of new long-range fuel tanks in the outer wings. The new tanks, installed by Aircraft Tank Service, Inc., Burbank, Calif., increase the fuel capacity of the *Lodestar* to 220 gallons per each outer wing. The tanks were designed and developed by Aircraft Tank Service, Inc.

Safe Flight Instrument Corporation, White Plains, N.Y., has purchased a DC-3 to be fitted out as a flying laboratory for lift instrumentation. According to Leonard M. Greene, president of SFI, the new plane will be used in research and development projects, along with SFI's D18 and Cessna.

George Bevins and Skip Nealy, chief pilot and copilot for George M. Brewster and Sons, Inc., Bogota, N.J., brought their company's DC-3 (N13E) to Aerodex for a new paint job and installation of one-piece windshield. Bevins also is Brewster's NBAA representative.

Curley Korb, chief pilot for Westinghouse Electric, has had Page Airways install a Sperry Zero Reader, an A-12 Autopilot, and extensive radio equipment in Westinghouse's newly acquired B-23.

Pittsburgh Consolidation Coal Co. has added a Flite-Tronics CA-20 cabin amplifier to its B-23. Installation was made by Qualitron, Inc.

Official NBAA Report

NATIONAL BUSINESS AIRCRAFT ASSOCIATION, INC.

(formerly Corporation Aircraft Owners Association)

National Business Aircraft Association, Inc. is a non-profit organization designed to promote the aviation interests of the member firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable business aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. NBAA National Headquarters are located at 1701 K Street, N. W. Suite 204, Washington 6, D.C. Phone: National 8-0804.

Seventh Annual NBAA Meeting

Highlighting the Seventh Annual Meeting and Forum of the National Business Aircraft Association in Dallas, Texas on October 27-29, 1954, will be the presentation of Annual Awards to member organizations and first pilots with outstanding safety records in business-flying operations.

Henry W. Boggess, Director of the Aviation Department of The Sinclair Company, Tulsa, Oklahoma, and Chairman of the Awards Committee, stated that the annual awards had two important objectives: "First, to call attention to the tremendous growth of business flying throughout the United States and, second, to focus public awareness on the remarkable safety records being established by business aircraft."

Strict rules and regulations will govern the selection of NBAA recipients, based on the accident reporting standards established by the American Standards Association and the National Safety Council. "Companies or pilots winning these awards will be proud to receive them," Mr. Boggess added.

At the NBAA Annual Luncheon, Friday, October 29, Pilot Safety Awards will be presented to the first pilot of each member organization who has flown business aircraft 500,000 or more miles without accident involving damage to property or injury to persons. Principal speaker at this luncheon will be Hon. Robert Ramspeck, Vice Pres., EAL, and former member of Congress from Georgia.

The Special Safety Award will be conferred upon member organizations at the NBAA Annual Banquet, Friday nite. To be eligible, these members must have flown business-owned aircraft 1,000,000 or more accident-free miles. Guest of honor and distinguished speaker Friday night will be Hon. Seaborn Collins, National Commander, American Legion.

All recipients will receive engraved certificates from the Association attesting to their significant contribution to safety in the progress and development of business flying.

Both the luncheon and banquet are to be attended by representatives of over 400 leading business organizations, government officials, and top aviation industry leaders.

NBAA has recognized its responsibility for encouraging safety in the business aircraft field. In 1953, sixteen member companies received certificates for each having operated aircraft for one million or more consecutive plane miles without accident involving damage to property or injury to persons. The planes of these 16 companies flew a total of 28,832,086 accident-free plane miles. Additionally, 41 pilots of member companies were given awards in 1953 for each having flown business aircraft for 500,000 or more accident-free plane miles. These 41 winning pilots represented an excess of 21,000,000 airplane miles without injury to persons or damage to property.

NBAA Favors Strato-Port

The Board of Directors of NBAA is of the opinion that the Strato-Port Project (*Skyways*, Aug. 1952) offers one of the most promising solutions thus far advanced to meet the increasingly serious problems of airport location and cost. This is especially true in off-airway industrial areas where many airports are inadequate or there are no airports at all.

Approximately 70% of today's business flying is away from regular air routes into small industrial communities. In many cases, these communities do not have either the funds or land for the development of conventional multi-runway airports. An acute need exists for low cost yet adequate landing facilities, capable of handling all types of air traffic regardless of prevailing wind direction and velocity.

In addition to the small community airport problem, the Strato-Port Project also could be practically applied to major high density airports, such as Dallas and Newark, which are closely surrounded by commercial and residential areas. In these cases, dual runways with the unique perforated "Wind Eater" fence installations paralleling the runways that characterize the Strato-Port, developed by the Strato-Port Corporation of America, Washington, D. C., may well simplify air traffic control, increase landing approach safety, by-pass dangerous runway obstructions, and reduce operational and maintenance costs. Also, the growing difficulties and cost of land acquisition in densely populated areas, the mounting criticism of aircraft noise, and the recognized hazards of aircraft criss-crossing the air-space at low altitudes over communities near the airport, could be materially diminished by the one-direction runway concept.

NBAA strongly supports the need for a full-scale test and evaluation of the Strato-Port to determine the practicability of its design features and its potential value in meeting the growing airport dilemma around the nation.

Safety-in-the-Air Program

NBAA is a member of the newly established AD HOC Committee of the Air Coordinating Committee NAV Panel organized to formulate a program of pilot safety education, with particular emphasis on flight operations in heavy traffic conditions.

At a recent meeting, various methods of developing the educational program were discussed, including putting slogans or warnings on radio ranges or weather broadcasts in high-density traffic areas; a colorful sticker for the instrument panel reminding the pilot to be on the alert for outside traffic; a safety poster series, and other unusual gimicks which would emphasize safety to the eyes of the pilot.

Further information about this most important educational program for safety in the air will be carried in a subsequent *NBAA Report.*

Give Yourself an Even Break

How frequently do you take off for a destination and not file a flight plan? In other words, who on the ground knows of your intended flight path and whom you have aboard? In the event of an unscheduled landing in someone's cornfield or mountain top, it would be beneficial to the searchers to have some basic information. The simplest way to overcome this problem is to file a flight plan with the proper agency regardless of the weather along your proposed flight. If such facilities are not available, leave a flight plan with a *responsible party at the point of departure.* This flight plan should include the *names of all passengers* in addition to the information required on the standard flight plan.

Two things to remember about the flight plan: once you file it, follow up! When you land, close it with the nearest of the agencies. If you do these things, there is less chance of your becoming an incident, either "actual" or "false." By failing to close your flight plan, you will become a "false" incident and may thus deprive someone who really needs assistance from obtaining it. There are three additional rules to remember which, if followed, will further increase your chances of being rescued by a Search and Rescue Organization. These are:

1. Prior to flying over uninhabited areas, make sure that proper emergency kits, including rations and first aid equipment, are aboard the aircraft.
2. Should you crash land in an uninhabited terrain, stay by your plane.
3. As soon as possible after a crash landing, build and maintain a smoke fire.

Meet the NBAA Members

FALSTAFF *operates DC-3. Chief Pilot is Hank Haddock (left), shown here with Harvey Beffa, gen. mgr., Duke Irwin, copilot, and Harry Pettey, secretary and NBAA rep.*

Name of Organization: **Falstaff Brewing Corporation**

Address: 3617 Olive Street, St. Louis 8, Missouri

President: Joseph Griesedieck

NBAA Representative: H. J. Pettey

Chief Pilot: B. N. Haddock

Nature of Business: Falstaff Brewing Corporation, the sixth largest brewing firm in the nation, has streamlined its executive transportation methods to keep pace with the rapidly expanding needs of its nationwide business. Company officers from Falstaff's executive offices in St. Louis maintain a modified DC-3 which flies between the company's plant cities and distributor locations from coast to coast.

Aircraft Operated: One DC-3

Most Flights Made to: Falstaff Plants located in Omaha, Nebraska; New Orleans, La; Fort Wayne, Ind.; San Jose, Calif.; and other key distributor cities from coast to coast.

Average Number of Hours Flown Per Month: 60 hrs.

PORT AUTHORITY *uses two Bell copters. Chief Pilot is Sammy Chevalier (right), shown here with Ray Chaisson, towing copter from hangar, and Mechanic Mitchell*

Name of Organization: **The Port of New York Authority**

Address: 111 Eighth Avenue, New York 11, N. Y.

Officials: Austin J. Tobin, Executive Director
Fred M. Glass, Director of Aviation

NBAA Representative: Herbert O. Fisher, Chief Aviation Development Div.

Chief Pilot: Marcel O. (Sammy) Chevalier

Nature of Business: Bi-state Public Agency, operating 17 transportation facilities, including bridges, tunnels, piers, bus terminal, truck terminals, and airports.

Aircraft Operated: Two Bell 47-G helicopters, license numbers N938B and N942B

Most Flights Made to: Ten heliports in metropolitan area.

Average Number of Hours Flown Per Month: About 50 hours per month per helicopter.

Hiller Helicopter, Palo Alto, Calif.
NBAA Rep—William Callery, Jr., Chief of Flight

Norman Larson Co., San Fernando Valley Airport, Van Nuys, Calif.
NBAA Rep.—Norman G. Larson, President
Chief Pilot—Jim Dyerly

Southern Airways Co., Atlanta Airport, Atlanta, Georgia.
NBAA Rep.—Jess Childress Vice President
Chief Pilot—Gordon D. Fletcher
Company operates—5 Beech *Bonanzas* 1 Super D-18.

Union Producing Company, Shreveport, La.
NBAA Rep.—E. P. Jeter, Chief Pilot.
Company operates—Convair "340," Douglas DC-3, 2 Lockheed *Lodestar,* 3 Beechcraft D-18's, Grumman *Mallard.*

Laboratory for Electronics, Inc., Boston, Mass.
NBAA Rep.—Addison D. Cole, Vice President
Chief Pilot—Harold Morgenstern
Company operates—D-18 Beechcraft, B-50 *Twin-Bonanza, Bonanza.*

Michigan Tool Company, Detroit, Mich.
NBAA Rep.—Paul C. Holst, Chief Pilot
Company operates—Lockheed *Lodestar.*

United States Steel Corp., New York, N. Y.
NBAA Rep.—D. M. Teel, Chief Pilot
Company operates—2 Lockheed *Lodestars*

William C. Wold Associates, New York, N.Y.
NBAA Rep—Wm. C. Wold, President

Ohio Aviation Company, Dayton Municipal Airport, Vandalia, Ohio.
NBAA Rep.—J. E. Farrell, Vice Pres. & General Manager
Company operates—Bonanza, Beechcraft D-18

Reserve Mining Company, Cleveland, Ohio.
NBAA Rep.—T. A. Jones, Chief Pilot
Company operates—Douglas DC-3

Piper Aircraft Company, Lock Haven, Pa.
NBAA Rep.—W. T. Piper, President
Company operates—3 Piper *Apaches,* Piper *Tri-Pacers, Super Cubs.*

Reading Aviation Service, Inc., Municipal Airport, Reading, Pa.
NBAA Rep.—Alfred M. Bertolet, Chief Pilot & President.

Shamrock Oil & Gas Corp., Amarillo, Texas.
NBAA Rep.—James E. Boyd, Chief Pilot
Company operates—Lockheed *Lodestar,* Beechcraft D-18.

Temco Aircraft Corp., Majors Field, Greenville, Texas.
NBAA Rep.—Herrol Bellomy, Plant Manager.
Chief Pilot—V. L. Denman, Jr.
Company operates—4 Temco *Riley Twins*

Outboard Marine & Mfg. Co., Milwaukee, Wisc.
NBAA Rep.—W. J. Webb, Vice President.
Chief Pilot—Jack Losee
Company operates—DC-3, D-18.

Only the Cessna 170 Offers

All-Metal Construction, World's Safest, Smoothest Landing Gear, 15 Other Exclusive Features For Only $8295

Cessna 170 AIRCRAFT COMPANY

1▶ Smooth 6-Cylinder Power

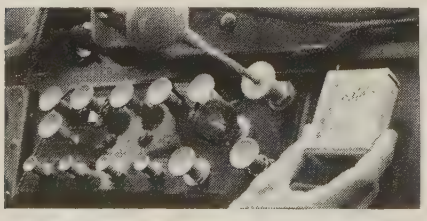
Cessna is the only airplane in the low-price field that offers you a powerful 6-cylinder, 145 H. P. engine! It cruises over 120 m.p.h. yet it's so smooth, quiet, vibration-free that when the engine is running you can rest a glass of water on the cowling without disturbing the contents!

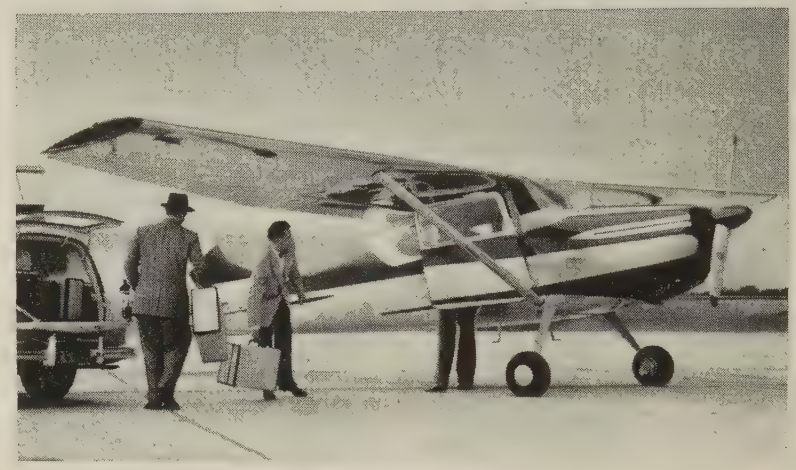
2▶ The Landing Gear that "Gives"

Cessna's exclusive landing gear flexes outward and upward to absorb the shock of rough fields. It's simple in design, has no moving parts, requires no maintenance!

3▶ Compact Control Panel

All controls are grouped within handy 6" reach of the pilot's hand. There's a new sloping map compartment, room for 2 extra radios, 8 additional instruments. Attractive non-glare instrument panel is evenly illuminated by dual non-reflecting lights.





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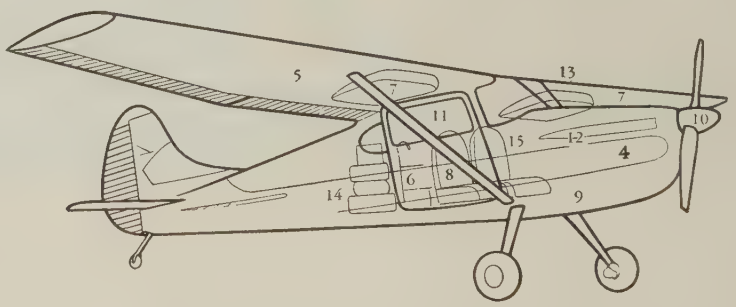
With minimum care, your Cessna 170 will look as factory-fresh in 5 years as it does today! Metal greatly increases over-all airplane strength, adds extra economy, utility, resale value, affords best protection against weather, lowers maintenance. Cessna 170 is the only all-metal airplane in the low-price field, sells for only $8295! For more information, see your nearest Cessna dealer (listed in the yellow pages of your telephone book) or write CESSNA AIRCRAFT CO., DEPT. S-11, WICHITA, KAN

Cessna 170 Extras—All Standard!

. . . Undisputed Proof That Cessna 170 Is Your Best Buy In The Low-Price Field!



4▶ 145 H. P. CONTINENTAL ENGINE
5▶ "PARA-LIFT" FLAPS
6▶ 120-LB. LUGGAGE CAPACITY
7▶ 42-GALLON FUEL CAPACITY
8▶ SOFT, FOAM-RUBBER SEATS
9▶ 6-OUTLET HEATING AND VENTILATING SYSTEM
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11▶ *FULL* 4-PLACE COMFORT
12▶ SHOCK-MOUNTED INSTRUMENT PANEL
13▶ DIRECT-READING FUEL GAUGES
14▶ CARGO TIE-DOWN RINGS
15▶ STALL WARNING INDICATOR

4 GREAT CESSNAS 170 180 195 310 THE COMPLETE AIR FLEET FOR EVERY BUSINESS NEED

Gilfillan Unveils a New Low-Cost Multi-Use Radar

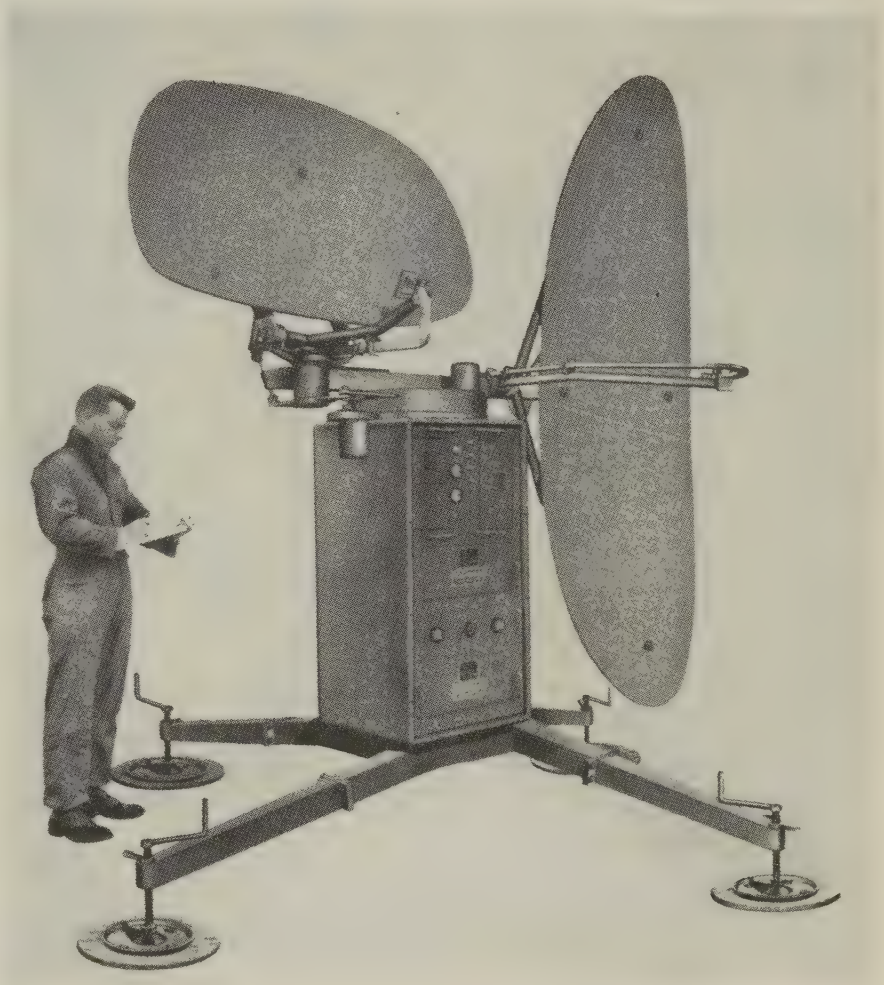
To both military and civilian aviation people, the name *Gilfillan* has been synonymous with GCA ever since WW II. The dean of American companies engaged in radar development, Gilfillan has enjoyed a well-deserved corner on the radar market for both military and civilian use. As is proper in the national interest and in the American way of free competition, this leadership has been challenged in the last few years by electronic companies, some new and some old and venerable in allied fields.

Speaking strictly operationally, it is not surprising that no major competitor in this field can long hold onto any significant advantage in design or production. The demand and need of the flying public which has only just begun to taste the advantages of radar, will provide ample stimulation to insure that progress will not stop with the development of lighter, more portable and less expensive radar.

To the pilot, the ultimate goal is to be able to "see" his way at all times in flight, regardless of weather. The marvelous navigational radio devices, both ground and airborne, which he must "interpret" or "read" are only a second-best solution compared to the ease of operation in truly visual weather conditions. Radar must and will give this answer eventually. At first the pilot may have to accept, as he does now, the assistance of ground radar where available to "back up" his airborne efforts, and these services are becoming daily more available, more reliable and more willingly employed.

While this is so, the availability of such service is tied inevitably to the cost, reliability and versatility of the ground radar. With this thought, Gilfillan has introduced its new Quadradar.

For the first time, they offer to the flying public the services of a unit that is so light and rugged that it can be picked up and transported almost at a moment's notice to any desired site. This offers not only an obvious military advantage but also a significant convenience factor for civilian use where heretofore expensive, permanent construction projects have been a deterrent to economic justification at other than the largest metropolitan terminals.



Quadradar offers surveillance, precision approach, height finding, and ground control

In the transportability of the Quadradar lies a key to the added versatility of quick displacement to serve all runway approaches where simple re-orientation of the antenna array is not sufficient to cover major changes in wind direction, as at intersection of main runways.

Noteworthy features of this new radar are two uses which previously were so economically unfeasible that they were conspicous by their absence in civil radar, namely, height finding and airport taxi control.

But, to operational people who must use these things and to pilots who have developed an interest in any gadget on which they may trust their safety, the biggest thing is the simplicity achieved by placing all four operational features in one presentation unit, selectable by the operator at will and as necessity demands. Surveillance, Precision Approach, Height Finding and Airport Ground Control are to be had by selection on one presentation.

It is true that at many large terminal fields, the separation of one or more of these features for simultaneous operation is a must. But a price is exacted that only can be paid or justified by such multi-million dollar installations. For the other busy terminals, the availability of this four-way versatility will pay for itself many times over in increased efficiency of operations without sacrificing safety.

All the now-familiar advantages of currently used civil radar such as "de-centering" scopes for increased range of sweep areas, a moving tar-

Gillfillan Unveils New Low-Cost Multi-Use Radar

get Indicator for easier definition of airplanes as compared to "ground clutter" otherwise obscuring the scope, and selection of range for increased accuracy are present in Quadradar.

Gilfillan doesn't mention it but some of the familiar disadvantages are still present, namely, the lack of true television-type contrast for daylight operation as compared to the tolerated but never satisfactory photographic dark-room type operation.

The more-aggravating and serious problem of rain or snow precipitation obliterating the targets on the scope is still with us but like others, Gilfillan has worked on this unceasingly and signs indicate that the solution is at least approaching. Their circular polarization of antennas plus other design features have gone a long way towards achieving a practical operation during this most unhappy of operating conditions when the services of radar are most needed. The pilot in the cockpit sweating out a low approach in rough, storm conditions is no less unhappy than the ground operator, desperately trying to help, who must repeatedly broadcast "I no longer have you in radar contact!"

The step forward that Gilfillan has made in both design and availability of this Quadradar should signal a new lease on the goal of eventual all-weather operation, coming as it does at a time when curtailment of funds virtually eliminates old-style multi-million dollar installations.

Air-Aids Spotlight

BINGHAMTON, N.Y. – *Back-course ILS procedure, when approved, may require simultaneous use of ILS, VOR and ADF.*

BURBANK, Cal. – *CANOGA PARK MHW radio beacon now fully associated with ILS as LOM Outer Locater ident "BU."*

CINCINNATI - INDIANAPOLIS: *Air Route Center moved to INDIANAPOLIS WEIR-COOK Field. Area unchanged and CIN direct-voice frequency 119.7 mc remote controlled from IND.*

ELMIRA, N.Y.–*ELMIRA LFR southeast-course swing to 128°-308° is the first step in the realignment of Red 23 to straight airway ELM-LGA. Pilots used to employing LAKE CAREY FM on North course of WILKES-BARRE to check intersection, please note.*

FORT WORTH, Tex.–*MEACHAM Field tower now operative 0700-2300 only.*

HOUSTON, Tex.–*ILS transition involves RADAR fix.*

OTTAWA, Ont. *Tower VHF now 118.3 mc.*

PITTSBURGH, Pa.–*(Allegheny Cnty) ILS complete system temporarily out. McKEESPORT ADF approach same runway unaffected. VOR approach revised.*

ROCHESTER, N.Y.–*Use caution with all 75 mc Fan Markers this area. WHAM-TV side-band emissions on this frequency.*

SYRACUSE, N.Y.–*Use of ILS back-course requires two VHF nav receivers.*

WASHINGTON, D.C.–*Note operational tests in this area–ALL navigational facilities being voice identified.*

RTCA Describes In-Flight System of Checking Airborne VOR Receivers

The art of flying VHF navigational aids has not progressed so far that too many pilots have forgotten that old comfortable feeling that came with the steady beat of the desired course signal of the fast-disappearing LF four-course ranges.

Today, it is often a disappointing surprise to open the *Airman's Guide* and find out the number of the new VOR ranges that are NOTAM'd as unreliable through a startling percentage of their coverage area. Add to that a bit of human nature and it is quite easy to assume that any discrepancies displayed in course data on one's VOR receiver is solely chargeable to ground station error. No serious problem in VFR, it is significant in IFR conditions that whereas the ground station has been accurately checked and its deficiencies published, the airborne receiver's errors at any time enroute are an unknown factor.

RTCA (RADIO TECHNICAL COMMITTEE for AERONAUTICS) has come out with a bulletin (Paper 66-54/DO-56, April 15, 1954) describing the program under way to develop and expand a system of airborne receiver checking that should interest any cross-country pilot.

Obviously, the existence of a suitable monitor employed at each VOR to disable the facility in event of malfunction and the flag alarm in the airborne indicator dispose of the problem of outages or spurious transmissions capable of activating these two safety aids. And, of course, the creation of VOR Test Signal installations at many major terminals and the publishing of VFR check-points across the country serve to reduce the probability of airborne failure without adequate warning. But like the patient's toothache that disappears at the dentist's waiting room door, these are little assurance when a VOR receiver's indications acquire a suspicious appearance during an IFR operation. Or worse, there may be no apparent circumstance to warn the pilot that his indications are inaccurate!

When an aircraft is equipped with two VOR receivers, their accuracy may be checked by tuning both to the same station and observing the indicated bearings. It is highly improbable that the two would fail in the same manner and at the same time. When they do not agree within the required tolerances, the pilot must rely on one receiver—but *which?*

If the pilot is flying the normal direct route between two VOR stations, he may accomplish this in the same manner as a pilot who normally has only one VOR receiver. If the indication from the station behind agrees with the reciprocal of the indication from the station ahead (again within allowed tolerances), preferably checked at mid-point where both signals are received at their best strength, he knows his equipment is functioning properly.

Also, if he is high enough to receive signals from an off-course station at the exact time of passing over an enroute station, he can again check his bearing indication by comparison with the published bearing from the off-course station to the station then over.

Of course, no matter how much in error a VOR receiver may be, it may always be relied upon to lead the aircraft to the VOR station to which it is tuned, providing it is giving stable course information. In

PLANE FAX

Your Best Week-end Flight Plan for December

See the "Wings Over the Nation" Air Show at Long Beach Municipal Airport, December 10-12, Long Beach, Calif. You can get quality Standard Aviation products and service at the scene of the show.

Flying a tow line to a stranded army barge!

Salvage flight over breaking seas! That was Merrill Ginn's job when an ammunition barge went aground near Long Beach, Washington. Flying from his base at Clatsop County Airport, Astoria, Oregon, he succeeded, after several attempts, in laying 3,000 feet of line from the rescue tug waiting offshore to the stranded barge, where seamen secured it for the salvage try.

"Whether I'm flying over water or on a week-end hop," says Mr. Ginn, "I always use RPM Aviation Oil to keep my engine in top condition. On longer trips I carry extra cans with me, to make sure I won't have to use anything else. It really cuts down engine wear, and ends all trouble with sticking rings and valves. I use Chevron Aviation Gasoline 80/87, too. It gives me plenty of extra power when I need it, and yet I can lean it down for economy when I'm cruising."

You'll get longer engine life and better performance for your plane if you use quality Standard Aviation Products. You can get them throughout the West with your Chevron National Credit Card. Use it for overnight tie-down charges, too—no need to carry extra cash.

TIP OF THE MONTH

If part of your flight will be at night, it's wise to check your running lights before you take off.

T.M.'S "RPM," "CHEVRON," REG. U.S. PAT. OFF.

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STANDARD OIL COMPANY OF CALIFORNIA

new **ARC** course indicator puts two instruments in ONE!

ARC #16706

Now users of the light, compact A R C Type 15D navigational receiving equipment can employ a single panel instrument that performs the work of two units previously used. The cross-pointer meter and the course selector have been combined into one part that fits a standard 3⅛" instrument hole. This saving in instrument panel space is important, particularly now that dual VOR installations are so popular. In addition to the space saving, installation costs are cut. Ask your dealer to specify the new #16706 Course Indicator as part of your 15D Installation—whether single or dual. The indicator may be purchased separately for use with older Type C and D equipment. Write for complete data.

Aircraft Radio Corporation

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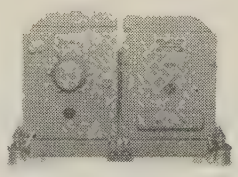
TYPE 15D EQUIPMENT

For Airborne Reception of

- **Omni-Directional Ranges**
- **Visual-Aural Ranges • Runway Localizers • GCA Voice**
- **Simultaneous Voice**



R-13B Receiver with D-10A Dynamotor
B-13 Converter, E-14 Rack and M-10 Mounting

C-22A
Control Unit,
M-18 Mounting

A-13B Antenna

RTCA Describes In-Flight System of Checking Airborne VOR Receivers

the latter method of checking, the known angular error displayed by the indicator with respect to the off-course station could in theory be applied to the station for the purposes of his instrument approach (says RTCA).

Fortunately, RTCA is not satisfied with all the foregoing, and the aforementioned report describes the efforts being made to develop more and better systems of airborne en-route checking.

Suggested were: imposing the test signal on selected air traffic control frequencies. No additional frequencies would thus be required, currently a problem with two test signals, as on 112.0 at fairly close major terminals. But because the present air-traffic system is based on single-channel simplex (talk and receive on same frequency alternately) the test signal could not be made continuously available. At high-density locations like LaGuardia, Chicago and Washington, this would not be a factor as they are on the air in excess of 50% of the time anyway. But the constant breaking of transmissions would still be awkward for the airborne VOR receiver, as the damping which is provided in the receiver indicating systems is such that it may take up to five seconds to indicate the bearing!

Another suggestion is to transmit periodically a test signal from every VOR station. The necessary interruption of the standard VOR signal would be as intolerable under certain circumstances as the old non-simultaneous weather broadcasts on loop-type LF ranges.

Currently, 112.0 mc will continue to be the frequency for test signal facilities, but 111.0 mc is planned for the future. And at locations where frequency separation from other navigational aids, another even-decimal frequency within the 108 to 112 mc band will be utilized. All VOR test signals should transmit a test bearing of 0° *"From"* with a maximum permissible deviation of plus or minus 1° at the station and should be identified by the transmission of continuous dots with a modulation pitch of 1020 cps, similar to LF ranges.

As a goal, the RTCA sets its sights on a test system that will provide the pilot with a continuously available means of checking the accuracy of the bearings indicated by his VOR receiver without requiring him to retune it nor to reset its Omni-Bearing Selector in order to obtain checks.

Landing Minimums Revised By CAA

In the last decade during which non-air carrier professional flying has grown so rapidly, many professional corporation crews have champed at the arbitrary restrictions imposed on their exercise of the art of low instrument approach. After much effort, some pilots have obtained waivers down to air-carrier minimums.

Apparently recognizing the obvious fact that few such crews leave any stones unturned in equipping and qualifying themselves to perform on the same operational level as their mandated brotherhood, the CAA in Washington has quietly revised the criteria employed in establishing the minimums published in the *Flight Information Manual.*

Since August 10th, and effective at specified subsequent dates, the CAA has been publishing for the general flying public, lower minimums based on the obstruction clearance minimums where such revision is pertinent. In some instances where terrain and obstruction clearance requirements permit, the straight-in ILS and GCA *Flight Information Manual* minimums will be as low as 200-foot ceiling and ½ mile visibility!

Straight-in Low Frequency Range, ADF and VOR minimums may be lowered where practical to 400-foot ceilings and 1-mile visibility. Further indication of the commendable policy swing towards less restriction and more uniform regulations, is the modernizing of the aircraft-type categories of minimums to more closely parallel air-carrier classifications specified in terms of type aircraft.

Instead of the old two classes of "stall speeds of 75 mph or less," and "more than 75 mph," the new minimums specify three categories: 1) Stall speeds of 75 mph or less—single and twin-engine; 2) stall speeds *more than* 75 mph—single or twin-engine; and 3) stall speeds more than 75 mph —more than two engines. The new minimums thus more closely and appropriately fit the performance capabilities of the three new categories of business aircraft being flown since the close of World War II. The light Twins, like the new Beech, Cessna and Piper, plus the few singles being flown IFR and the venerable DC-3 and D-18's thus will gain even more advantage in terms of their lower approach and landing speeds and greater maneuverability. The Convair and converted medium-bomber class executive ships like the B-25's, B-26's (both Douglas and Martin) will have appropriate minimums, and the DC-4 and *Liberator*-conversions accordingly.

IF YOU HAVEN'T BEEN TALKING ABOUT THIS AIRPLANE YOU SOON WILL—IT'S THE

CAMAIR 480

A SUPERIOR TWIN CONVERSION OF THE FAMOUS RYAN NAVION

Here is an entirely new concept of an executive aircraft with a combination of speed, safety and utility never before offered in its price class.

The Camair 480 is powered by two Continental O-470 B engines either of which is capable of sustaining flight above 8,500 feet at full gross weight.

Here for the flying executive is big airplane performance in a relatively small airplane at a substantial reduction in investment and maintenance cost.

PERFORMANCE DATA

Gross Load	3,930 LBS.
Cruise Speed 70% Power at 6,000 Ft.	192 MPH
Rate of Climb SL Two Engines	1,750 FPM
Rate of Climb SL One Engine	450 FPM
Service Ceiling Two Engines	22,000 FT.
Service Ceiling One Engine	8,000 FT.
Range	900 Miles
Wing Loading	21.3 LBS./SQ. FT.
Power Loading 480 HP	8.2 LBS./HP.
Useful Load	1,200 LBS.
Fuel	108 Gals.

AMERICA'S MOST POWERFUL LOW PRICED EXECUTIVE AIRCRAFT. COMPLETELY REMANUFACTURED BY

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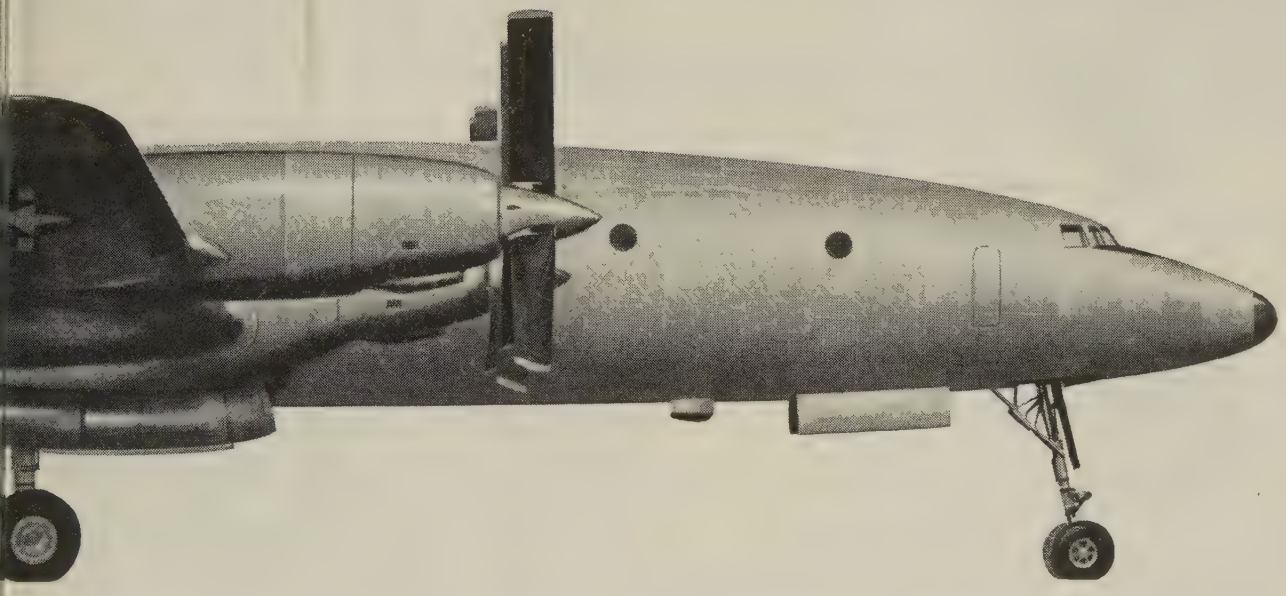

Lockheed's Turbo-prop Super Constellation

Nearly 100 miles an hour faster than any propeller airliner now in service. This powerful new Super Constellation, equipped with American-designed and built Pratt & Whitney T-34 turbo-propeller engines, is now flying for the U. S. Navy. Its tests promise new speed, new performance, and greater economy potentials in the transport aircraft field. This new transport, Model 1249, is another example of Lockheed transport leadership. Watch for important news about this turbo-prop Super Constellation.

Lockheed *Aircraft Corporation, Burbank, California, and Marietta, Georgia*

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Hardman Flies With:

★ Beech Twin-Bonanza	★ Douglas DC-3
★ Twin Beech	★ Grumman Widgeon
★ Consolidated B-24	★ Grumman Mallard
★ Cessna 310	★ Learstar
★ Convair 340	★ Lockheed Lodestar
★ Boeing B-17	★ Lockheed PV-1
★ DeHaviland Dove	★ North American B-25
★ Douglas B-23	★ Curtiss C-46
★ Douglas Super DC-3	★ Sikorsky S-55

HARDMAN

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Radar Vision . . .

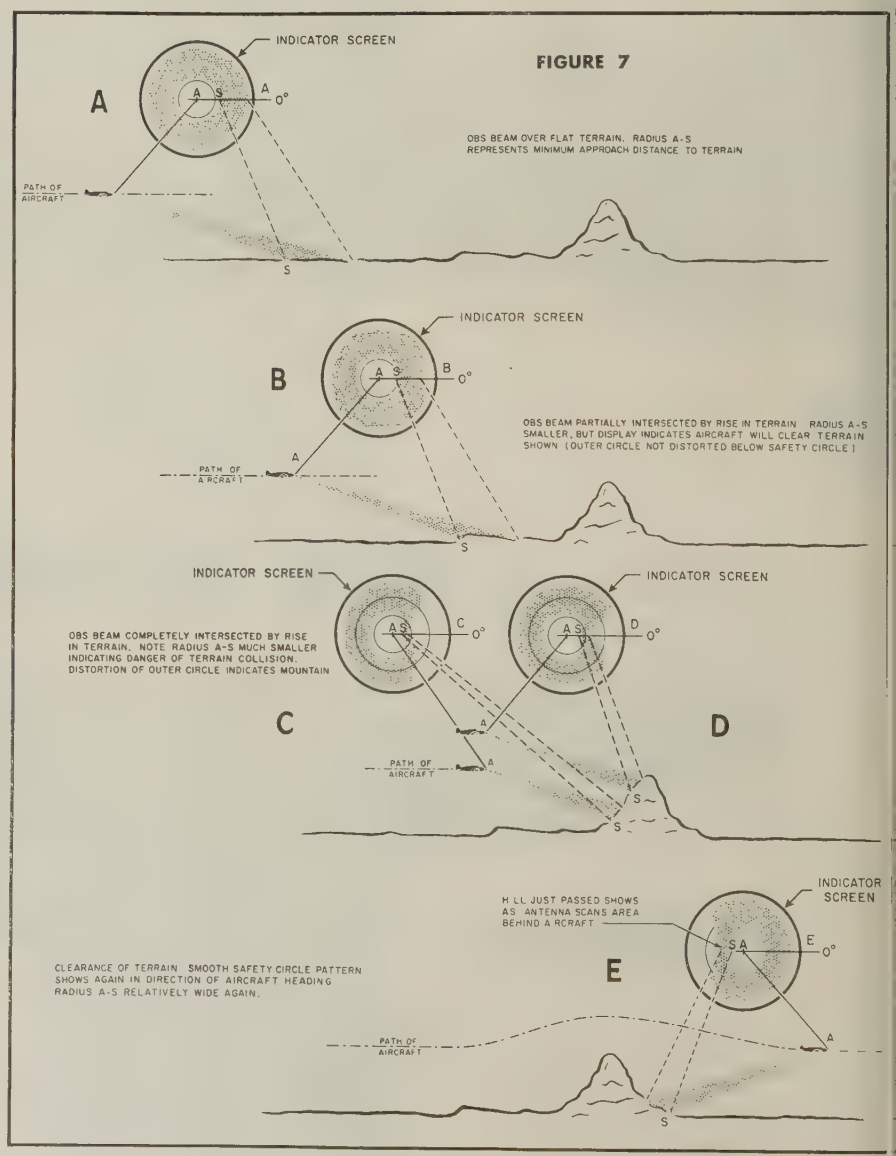
(*Continued from page* 17)

which may otherwise clutter the presentation. In the event this coating material is not used, an alternate method of eliminating these fuselage returns is to internally adjust the antenna to scan a sector of 240° (120° either side of the nose) on "Full" scan. By flipping the scan switch to "Sector," a 120° scan (60° either side of the nose) can also be selected. When the smaller scanning angle is selected, the sweep origin is offset toward the bottom of the indicator to permit display of greater detail of the area searched. *Figure 3* illustrates this "offset sector" type of scanning.

The set operates in accordance with conventional radar principles, although with superior performance attained through the latest developments in the field of electronics. On the indicator, the position of the aircraft is shown as a small bright dot in the center of the screen. In radar parlance, this dot is known as the "main bang," since it is the visual presentation of the radar energy at the moment it leaves the antenna. As the antenna rotates, a sweep trace line, extending from the center to the edge of the scope, moves in synchronism with it. At any given time, this sweep line points to the same azimuth position as the antenna. While rotating, powerful (45 kilowatt) pulses of super-high frequency (9375 megacycles) energy are emitted from the antenna. When these pulses strike an object, some energy is reflected back to the radar antenna. This energy is amplified, and displayed on the indicators as a bright spot. The size of the spot is proportional to the size of the target; the intensity of the spot is proportional to the energy returned from the target. This spot or pip is displayed on the scope in correct range and azimuth relative to the aircraft. Range circles are generated within the synchronizer, and are displayed on the indicators to facilitate range measurement. Ordinarily, land reflects more radio energy than water. However, rough water or clouds dense with precipitation produce bright indications.

When the area scanned by the radar is a portion of the earth's surface, the indicator presentation will have the appearance of a relief map illuminated by a rotary searchlight. *Figure 4* shows an indicator display of relatively flat terrain. As mentioned before, the equipment has three main functions: navigation, obstacle avoidance, and weather detection. To accomplish these

(*Continued on page* 36)



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DIMENSIONS AND WEIGHTS

Overall length	35'6"
Wingspan	44'5"
Height	11'6"
Wing area	268 sq. ft.
Empty weight	3900 lbs.
Max. useful load	1940 lbs.
Gross Weight	5840 lbs.

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Two Lycoming GO-435-C2B ..... 260 hp ea.*

Propellers: Hartzell, three blade, variable pitch, constant speed, full feathering

Fuel capacity ..... 190 gal.

All-metal, monocoque construction.

*Optional—Two Lycoming GO-480 (270 hp) engines. Performance ratings increase proportionately.

PERFORMANCE

Maximum speed (at sea level)	approx. 180 mph
Cruising range	over seven (7) hrs. with reserve
Cruising speed (at 7000 ft. and 72% power)	approx. 160 mph
Climb to 3000 ft.	3 min., 2 sec.
Service Ceiling (both engines)	18,000 ft.
Service ceiling (one engine)	over 5,000 ft.
Take-off run, land	787 ft.
Landing run, land	722 ft.
Time for take-off from water (no wind)	18 sec.

HERE'S a working ship that's specially designed for the man who's going places. Be he air-minded executive, aerial surveyor or company pilot, he'll go "sky-wide and handsome" in the exciting new Royal Gull.

If you're that man, this amphibian puts new, more useful wings at your command . . . provides convenience unobtainable in any other type of aircraft. Go when you want . . . at speeds approaching three miles per minute. Fly where you will... in 5-place executive comfort up to a thousand miles or more. And land where you please . . . any airport, lake or river can be your landing field.

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Radar Vision . . .

(*Continued from page* 34)

functions, two types of radiated beams are used. One is a mapping beam, used chiefly for navigation. The other, a pencil beam, is used for seeking out obstacles and hazardous weather. As may be seen from *Figure 5*, the mapping beam is fan-shaped. It scans a vertical angle extending to 40° below the aircraft's line of flight. Targets below this angle, such as ground clutter, may appear on the screen, but at reduced intensities. Both elevated and ground targets are scanned simultaneously by this beam. Since the scope presentation is two dimensional, targets of the same range and azimuth but with different vertical separation are superimposed upon one another on the display. The fan beam is effective for painting the terrain features below and surrounding the flight path but, because of its inability to discern differences in altitude, it is of little use in revealing any obstacles in the path of flight.

As may be further discerned from *Figure 5*, the pencil or obstacle beam is directed outward and is narrow, being 6° wide. Very little ground return is picked up from the sides of this beam. By tilting the antenna through its angles of tilt (10° upward and 15° downward), the radar picks out the elevated or airborne objects intersected by the beam, and the pilot can determine their altitude with respect to his aircraft.

When used for navigation, the fan beam is employed to scan the area surrounding the aircraft. The radius of the area scanned is determined by the range selected. Ranges of 5, 10, 30, 100, and 200 miles are available. The area scanned appears on the indicators as a relief map, showing objects such as cities, lakes, mountains, shore lines, etc. Large objects from which the reflection is strong will appear as spots. Objects which rise high above the ground level show as bright indications with "shadows" to their rear. These "shadows" are caused by the prominent objects blocking the radar energy from the terrain behind them.

A navigator, experienced in interpreting radar presentations, can readily convert them to locations on a map of the area over which the flight is being conducted.

Another method of navigating with the APS-42 is by means of ground racon stations. The APS-42 will receive and display coded identification signals from ground radar beacons. When operated on the beacon function, the equipment emits pulses having the same frequency (9375 megacycles) as on other functions, but instead of receiving its own echoes, it receives the ground beacon transmissions on 9310 megacycles (see *Figure 6*). The displayed beacon signals can be used for obtaining a fix of the aircraft's position (when displays from more than one ground beacon station are used), or the aircraft can be homed in on the racon station by turning to the heading that will keep the beacon signal on the aircraft's nose. The distance between radar beacon and aircraft can immediately be ascertained by comparing the position of the beacon signal with the ranger marker circles on the presentation.

When used as an obstacle avoidance device, the pencil beam is usually employed. The pencil or obstacle beam scans the area in front of, around, above, or below the aircraft. The area scanned depends upon the setting of the scan switch (fixed angles of scanning can be set in the equipment), the angle in which the antenna is tilted, and the range selected. The radar in this respect is analogous to a sharply focused searchlight searching for obstacles in the path of a moving vehicle. Normally, when employing the radar to reveal any obstacles in the path of flight, the pencil beam is directed slightly downward by tilting the antenna a few degrees. In this position, a pattern resembling a doughnut will be displayed on the indicators. The inner border of the displayed doughnut serves as a safety circle. The size of this "safety circle" will vary with altitude, being directly proportional to the height of the aircraft over the terrain directly below it. If any targets enter this circle, the pilot must take immediate evasive action by climbing or by changing his course to avoid a collision. *Figure 7a* illustrates this safety circle display on the radar screen. Note that the returns from the pencil beam show up as a doughnut on the screen, the inner circle or inner border of the doughnut being the safety circle. For relatively flat land, the doughnut pattern appears smooth and undistorted. When the radar picks up a rise in terrain a safe distance below the altitude of the aircraft, the object will be seen as a bright return on the outer edge of the doughnut, protruding toward the center of the screen, *Figure 7b*. When the terrain is dangerously close to

(*Continued on page* 38)

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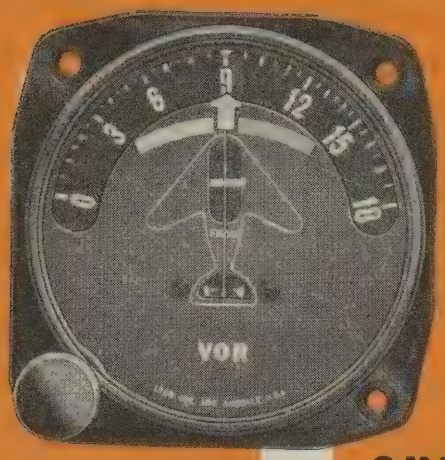

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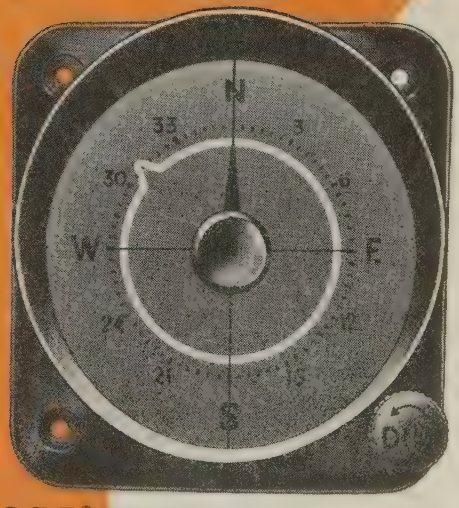
This is the new Lear three-in-one omni designed for pilots who prefer to "fly the needle." In one compact instrument, it combines the left-right deviation needle, the to-from meter, and a 360° course selector. A precision instrument throughout, built to airline standards of accuracy and ruggedness, but engineered to require a minimum of cockpit space.



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Preferred by thousands of pilots because it is entirely automatic. "The Lear Omniscope presentation," says Leighton Collins, editor of AIR FACTS, "throws out all the mental juggling. It tells you your bearing. You don't think. You just tune in the station and hit the navigational jackpot."

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Ft. Wayne Municipal Airport, Ft. Wayne, Ind.
City of Niagara Falls, Niagara Falls, N. Y.
Wichita Municipal Airport, Wichita, Kan.
City of Jacksonville, Jacksonville, Fla.
City of Colorado Springs, Colorado Springs, Colo.
Port of Oakland, Oakland, Calif.
Geiger Field, Spokane, Wash.
Port of Seattle, Seattle, Wash.
City of Syracuse, Syracuse, N. Y.
City of Phoenix, Phoenix Ariz.
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City of Dayton, Dayton, Ohio
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Capital Airlines, Washington, D. C.
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Aircraft Manufacturers

Douglas Aircraft, Tulsa & Lakewood, Cal.
The Glenn L. Martin Co., Baltimore, Md.
Boeing Airplane Company, Wichita, Kan.
Kaiser Manufacturing Co., Willow Run, Mich.
North American Aviation, Columbus, Ohio
Hayes Aircraft Corp., Birmingham, Ala.
Bell Aircraft Corp., Buffalo, N. Y.
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COMMUNICATIONS COMPANY, Inc.

CORAL GABLES, MIAMI 34, FLORIDA

Radar Vision . . .

(*Continued from page* 36)

the altitude of the aircraft, the display will assume the appearance of a doughnut, distorted by a bright protrusion with a shadow behind it (*Figures 7c and 7d*). Such a display on the indicator warns the pilot that he is approaching an obstacle, and to maneuver the aircraft to avoid it. *Figure 7e* illustrates the appearance of the display after the obstacle is passed.

The third major function of the APS-42, weather detection, works on the principle that clouds containing heavy precipitation appear on the screen as bright targets, the degree of brightness being proportional to the size and concentration of the water droplets. Thus, storm fronts and cumulonimbus clouds will return strong echoes, while fair weather cumulus, stratus, or light rain will return weak echoes. According to currently accepted theory, the regions of most severe turbulence within a storm are where the rainfall gradient is highest, *i.e.* areas which differ greatly in rate of rainfall. Thus, weather areas that are potentially dangerous are displayed on the screen as bright areas with sharp distinct edges. They indicate formations which may contain turbulence, hail or icing. With this visual presentation before him, the pilot can direct his aircraft through the less dangerous regions of a storm.

Other features of the APS-42 are:

Antenna Stabilization: Electro-mechanical servo circuits (using a vertical gyro as the sensing element) hold the antenna in the level-flight position when the aircraft is in a bank or in a nose up or down attitude. This eliminates unintelligible and erroneous radar presentations which are displayed when the aircraft is in some attitude other than normal flight.

Target Discrimination (TD): When turned to TD, the echoes of any selected 30-mile sector within 200 miles of the aircraft can be expanded to occupy the entire indicator screen. This feature is extremely useful for observing in greater detail any obstacles in the path of the air craft.

Fast Time Constant (FTC) and *Instantaneous Gain Control* (IAGC): At times, due to reflections from several targets, a radar receiver may saturate. This results in the targets appearing as one bright area on the presentation. Likewise, saturation may be caused by strong reflections from a single target. In both cases, target detail becomes lost. Use of FTC or IAGC eliminates this condition, and enables the pilot to pick out target detail from clutter.

Sensitivity Time Control: This control reduces the receiver gain for echoes from nearby objects and reduces to a negligible amount the clutter from weak signals within the first 10 miles of the aircraft.

The future of airborne radar is definitely assured. Its need will continue to increase in proportion to the growth of air traffic, and the increase in speed of individual aircraft. When our present transports are replaced by jet-powered craft, airliners won't have fuel to circumvent weather; if they can't fly above it, they will have to penetrate it. Radar will seek out the "soft" spots. But regardless of the type powerplant, a device which can show the pilot the location of minimum turbulence will permit safer and smoother flying. +++

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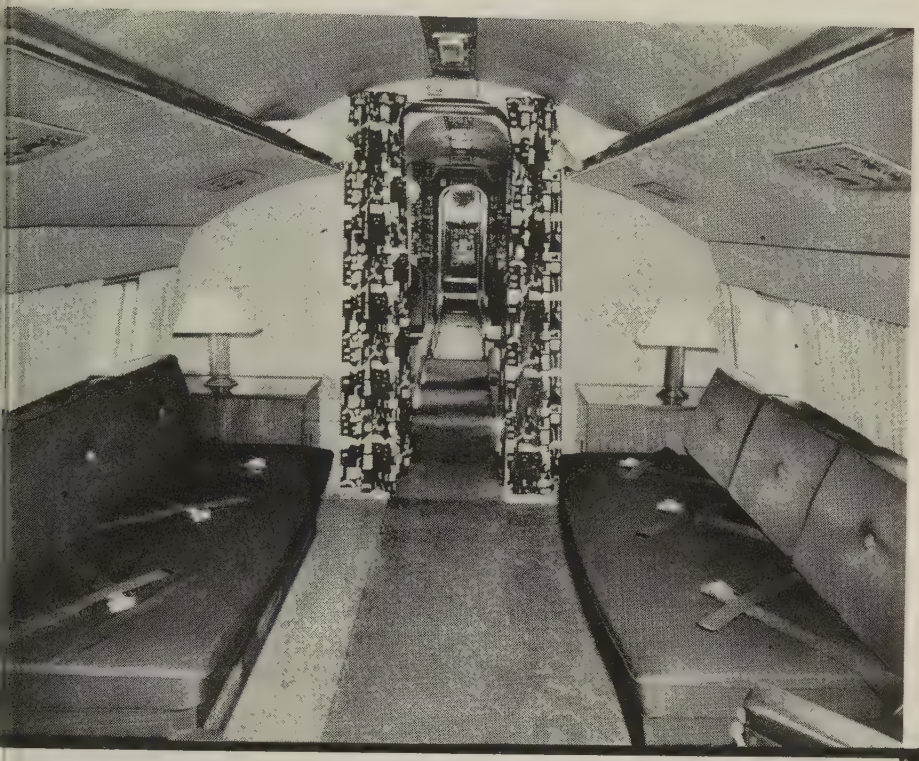

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William C. Wold Associates
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Executive Safety of your key personnel is of paramount importance . . . far outweighs the cost of the aircraft. Continued success of your business depends on it. The Martin 202 was the first post-war transport certificated under CAR Part O4B, assuring highest standards of safety.

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Skyways Round Table

(*Continued from page* 20)

the over-all capacity of the entire aviation department. In accomplishing this purpose it will be necessary to concentrate attention on developing those phases of the entire organization that the original survey or analysis proved weak. Through a program of this type, conducted on a progressive or continuing basis, the weaker points will be made stronger. This will automatically result in the increased capacity of the pilot and, at the same time, increase his proficiency and enable him to exercise sounder judgment.

"Relative to the actual flight phase of pilot proficiency, we feel that after the basic procedures of instrument flight into heavily congested areas have been accomplished, a detailed knowledge of the aircrafts' mechanical systems, maximum performance characteristics and emergency procedures should be given comprehensive attention both on the ground and in the air. The training in this aspect should be of such a nature that reaction to an emergency situation—simulated or real—will be calm, cool and collected."

Howard Pember (*Captain, The Texas Co.*): "A successful flight of any business aircraft is the result of the functioning of the aircraft and the crew. As far as the aircraft itself is concerned, we often replace a component that apparently is functioning well, because we have determined beforehand that it is time for an overhaul or to have a new one installed. Continued and periodic training for the crew is the way we approximate this preventive maintenance for the aircraft. By running through the procedures and the emergency conditions that we don't run into in our everyday flying, we can prepare ourselves and the rest of the crew to meet any condition that arises."

John Lambert (*Chief Pilot, U.S. Rubber Co.*): "No one can disagree with the basic idea of formalized flight training. But after that training, it becomes a matter of continuous practice to maintain that skill.

"Someone earlier mentioned judgment. I believe that judgment is inherent in any person, and what better way do we have of testing a man's judgment than by periodic tests? You can give a man landing and instrument approaches for 10 years under normal circumstances, but you aren't going to learn a thing about his judgment until you watch him operate under conditions that are not normal.

"I'd say that judgment is something you can't teach a man. He's born with it . . . or he isn't; and I think there are a lot of men flying aircraft today who do not have good judgment.

"It's my opinion that training should be given by some formalized flight training center. The U.S. Rubber Company operates one airplane and it is pretty difficult to go out and check ourselves. You just can't do it. However, if a company flies a fleet of aircraft, it is quite possible to take one man, preferably the chief pilot, and give him this formalized training course so that he in turn can run continuous checks on all the other crew members."

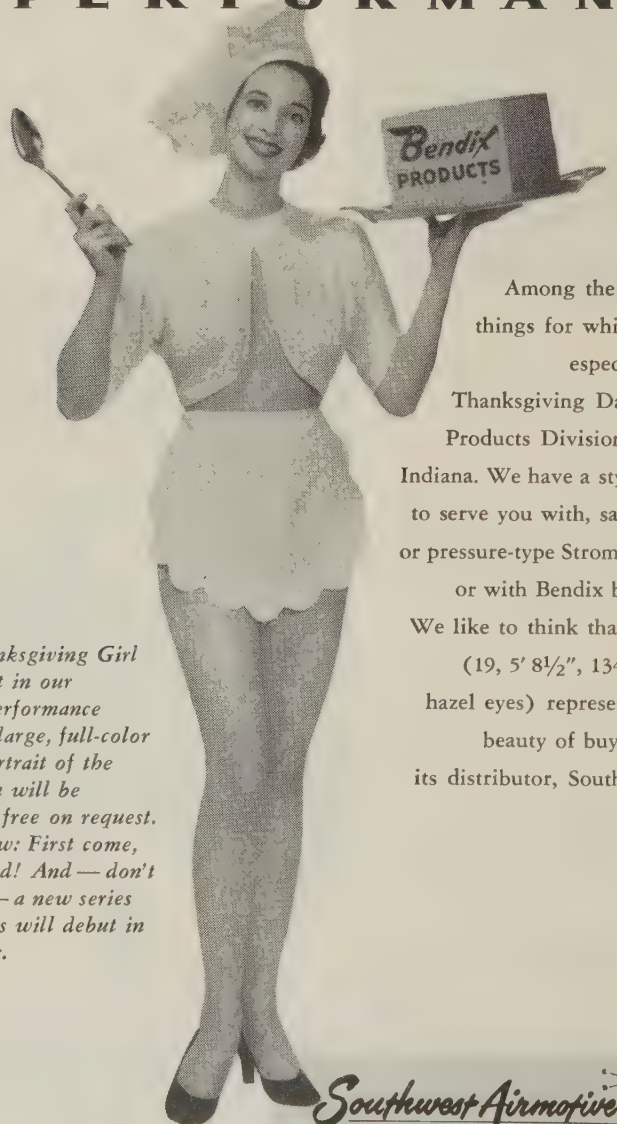
Al Ueltschi (*Pres., Flight Safety, Inc.*) "In our opinion, the best safety device in any airplane is a well-trained pilot. I would also like to say that training will never take the place of common sense. You can teach a monkey to do tricks, but you can't teach him to think.

"To be a professional pilot, a man has to be well trained and he also must have common sense. There isn't any question but that to fly a modern airplane, a man needs training. If there is any doubt about it, then United Airlines must have made a big mistake in spending $4,000,000 for simulators. United must have thought a long time before they spent that much money just for electronic trainers.

"Also, the manner in which this training is presented is important. If you are dealing with professional pilots, you must have professional instructors. I thoroughly disagree with the idea of one pilot checking another pilot *unless* that pilot is a good instructor and is a professional. I recall one airline that a few years ago would send two pilots out in a DC-3 to practice. One pilot would like to do one thing and so he'd practice that, and the other pilot liked doing something else, so he practiced what he liked to do. The particular phases of flying that both pilots *should* have practiced were never touched . . . you don't ever seem to get around to practicing what you should be practicing unless you have an organized program. A lot of money can be wasted in an airplane if time isn't utilized properly. We operate a DC-3 and it costs from $130 to $175 an hour. By having professional instructors, the latest electronic training devices and an organized

(*Continued on page* 42)

Model PERFORMANCE!



Our Thanksgiving Girl is the last in our Model Performance series. A large, full-color group portrait of the girls soon will be available free on request. Write now: First come, first served! And — don't go 'way — a new series of lovelies will debut in December.

Among the many wonderful things for which pilots may be especially thankful on Thanksgiving Day is the Bendix Products Division of South Bend, Indiana. We have a stylish chefess here to serve you with, say, float, injection or pressure-type Stromberg carburetors, or with Bendix brakes and struts. We like to think that Shirley Wright (19, 5' 8½", 134 lbs., black hair, hazel eyes) represents somehow the beauty of buying Bendix from its distributor, Southwest Airmotive.

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Motorists: here's proof...

Gulf's cleaner-burning, super-refined gasoline solves today's No. 1 engine problem!

This lamp is burning the "DIRTY-BURNING TAIL-END" of gasoline which GULF refines out
This lamp is burning NEW SUPER-REFINED GULF NO-NOX, the cleaner-burning super-fuel

Laboratory tests promised...

. . . these *immediate* and *lasting* benefits from this new, super-refined fuel:

More complete engine protection than from the so-called "miracle-additive" gasolines. Why? Because Gulf refines *out* the "dirty-burning tail-end" of gasoline (the No. 1 troublemaker in high-compression engines)—and then treats this new Super-Refined NO-NOX to give it a *complete range of protective properties*. It protects *every* part it touches against carbon, rust, gum.

Extra gas mileage in all your everyday, short-trip, stop-and-go driving.

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That's why new Super-Refined Gulf NO-NOX gives your engine more power-with-protection than you've ever known.

Road tests proved...

These cars, powered by New Gulf No-Nox, actually performed better than new . . . after 15,000 miles!

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COMPLETELY NEW! SUPER-REFINED

New Gulf No-Nox

THE HIGH-EFFICIENCY GASOLINE

Skyways Round Table

(*Continued from page 40*)

program, you cut down the number of hours you are going to spend in the air.

"Flight Safety, Inc. operates on the widely accepted principle that in any profession, training is never completed. Maintenance of skill is achieved by continuous practice and study rather than by examination and checks. The pilot can do his job no better than his airplane. He should know his own airplane and its limitations."

John M. Chamberlain (*Dir., Bureau of Safety Regulations, CAB*): "First, I would like to make a few general comments on the subject.

"It is gratifying, frankly, to be able to participate in a discussion in an area where I am not forced to defend the charge of having too many regulations. I think you will agree that this is one area in which no one will charge the Board with going overboard in setting up a lot of regulations that might unduly restrict this type of operation. There are reasons for this.

"Mr. Eger pointed out the fact that these companies that are putting several of their executives in their own airplane and flying them around the country, are a litle bit interested in their own safety. The Board is fully aware that there is a strong desire on the part of most people to protect themselves. Therefore, the CAB relies a lot on that and is trying to avoid detailed regulatory treatment in this and certain other specific areas. The Board, however, is nonetheless interested in the general safety of this type of operation and, undoubtedly, regulations will be changed from time to time as experience shows the necessity.

"As far as judgment is concerned, we have to rely on it within limits. I don't know whether this judgment is as simple as has been pointed out. Instead of its being a question of one man having it and another not, I'd say it's more a capacity to exercise good judgment under a certain set of circumstances. To my way of thinking, handling emergencies and exercising good judgment still calls for a great degree of training.

"The CAB is cognizant of the excellent record that has been maintained by business flying, and that is another reason why we feel justified in avoiding a lot of detail in Regulations. With the training activities that prevail on a voluntary basis and with the continuance of a good record and hopefully some improvement in it, we feel we have a lot to look forward to in this field."

Bill Person: *"Nev Watson, I noticed your hair stand up straight when John Lambert said that he did not think training influenced judgment. Do you have something to say on that score now?"*

N. W. Watson: "I'm afraid I will have to disagree. I think that the realization of the results of bad judgment is what makes you use good judgment. We all have a great desire for survival. I don't know whether flight training or instrument training is the answer, but there certainly is a need for it. Perhaps, if we studied some of our accidents, we'd find they were the result of improper training. The pilots of those aircraft undoubtedly could fly airplanes on instruments and I agree that the cause of the accidents could have been a series of emergencies; maybe the pilots weren't properly informed about weather conditions and, when the emergency came along, they couldn't cope with it. Perhaps it was bad judgment. It's also possible that the pilot's own physical fitness was not what it should have been. Perhaps there were emotional aspects. I think you have to go deeper than training to find out all that."

Bill Person: *"John Lambert, you had your hand up. Do you want to comment on Nev's remarks?"*

John Lambert: "I agree with Mr. Watson 100% because what he has said is that flight training is not the 100% answer. It is important that a pilot have continuous training and checks, but all the flight training in the world will not substitute for good judgment. Training will only go so far and from that point on it's up to the man himself. I can give you two instances of that.

"A certain captain went to Al Ueltschi's school for training and had to get over 20 hours of it. When I asked how capable he was, his instructor told me the man was just passable. That man is still flying and, to my knowledge, has not yet had an accident.

"Another instance concerns a copilot I had. This fellow actually claimed more flying time than I, but I had to fire him for poor pilot efficiency. He could fly the airplane satisfactorily, but he had poor judgment.

"What Mr. Watson is actually saying is that you would have to know how to handle the airplane; you'd have to know how to make instrument approaches, etc. But when emergencies come up, it isn't just technique, . . . it's good judgment."

Jean DuBuque: "John Chamberlain put his finger on a very significant point in connection with pilot proficiency training. He stated that such training is on a strictly voluntary basis. This indicates that most pilots recognize their responsibilities in connection with their flight operations and are more than willing to improve their proficiency.

"I would like to add that NBAA has been sponsoring meetings with business-aircraft operators in all major cities around the nation. One of the topics usually discussed is pilot proficiency training. There are many conflicting views regarding methods of accomplishment, but the comment usually made by a pilot is, 'I fly day in and day out, so why should I take a pilot proficiency training course? I know how to do my job without additional training.' The natural reply to this remark is to ask the pilot if he is capable of handling his airplane under *any* emergency condition. 'No', is the obvious answer because many pilots, although proficient in routine operations, lack the necessary ability and judgment to carry out emergency procedures when the chips are down.

"In order to encourage the adoption of sound pilot proficiency programs by business-aircraft operators throughout the U.S., the NBAA is working on basic standards for pilot proficiency training. These stand-

(*Continued on page 44*)

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TO
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SHELL

Skyways Round Table

(*Continued from page 42*)

ards will be based on Flight Safety Committee's studies into all aspects of business flying, and will be made available to our membership in the near future.

"Business flying is a most exacting profession. Not only must the pilot fly in all conditions of weather but, on many occasions, over unfamiliar routes to strange airports. By having standardized procedures based on practiced performance techniques, flight crews can be welded into efficiently operating units. In this way they can do a better job for their employer.

"It is recognized, of course, that the human element is the most variable factor in flying, especially from the safety standpoint. Today, the business pilot has at his command numerous electronic and mechanical aids which greatly contribute to the safety of his flight operations. The major problem, however, is to properly educate the pilot to use these devices effectively, supplemented with standardized procedures, sound techniques, and good judgment in their application."

Al Ueltschi: "We talk about judgment, but has anyone thought about *who* the judge is? Everytime we start talking about safety, we run into a lot of conversation, but I don't believe you are going to solve the problem by conversation alone.

"One statement was made here to the effect that some companies can't afford to tie up the airplane for training. I disagree with that. I say you can't afford *not* to. When you get a thousand hours on an engine, you won't hesitate to lay up the airplane for an engine change. The airplane is no better than the man who flies it. Therefore, I say you can't afford not to lay up the airplane for training. And you should have a definite training schedule.

"Getting back to the subject of judgment, where you run into problems is when you have one pilot training another pilot, unless he is a professional instructor. A person who has been flying for a few years will have definite ideas on how it should be done. In training, you must remember that there is more than one way to fly an airplane, that a certain procedure might be a good one but not necessarily the only one. For that reason we had to set up standard procedures.

"When you talk about the capacity of a man, why is one man more capable than another? I'd say it's probably because he knows more about his business and he has good common sense. Basically, you have to start out with a good man. Most of the pilots are good material or they wouldn't be around."

John Lambert: "Just as you said a few minutes ago, Al, 'who is to be the judge?' "

Al Ueltschi: "That's the reason I think you can not know what a man's judgment is by just talking to him and checking his emergency procedures. The question that's always in the back of a pilot's mind is, 'who is this fellow who is riding with me and judging me?' I think the answer to the training problem for the operators of business aircraft and airlines who operate too few aircraft to justify the high cost of acquiring and maintaining the latest electronic training devices and a staff of specialists is for them to buy this service. The same way that you buy airplane, engine, or radio overhaul service—go to a place that is in the business."

Bill Person: "*It would appear to me that good training would certainly help develop good judgment. After all, judgment is actually experience.*"

Harley D. Kysor: "We know from our own experience in this field that the average business pilot is a highly qualified and very competent professional individual. Therefore, the foundation of our program—set up on a flight-personnel level and management level—was designed for the primary purpose of providing whatever technical assistance necessary to assist in developing the capacity of the company aviation department and their pilots to their fullest extent without any cost to our policyholder.

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(*Continued on page 46*)

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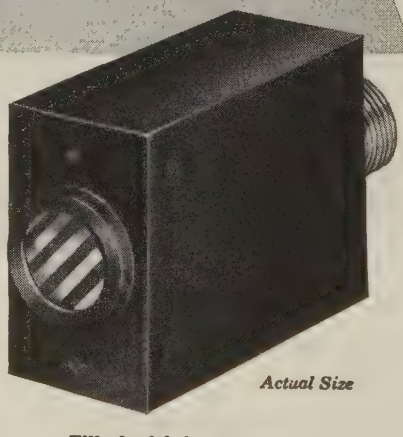

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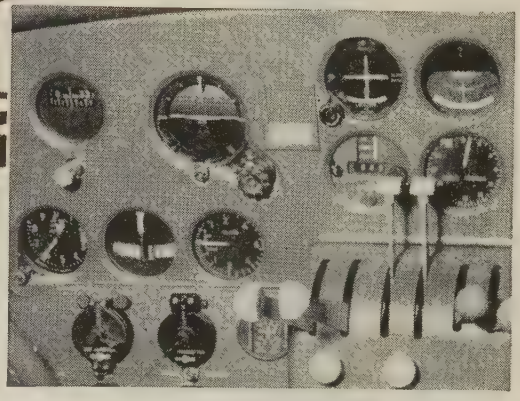

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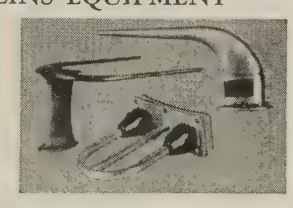

37R VHF Communication Antenna
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Skyways Round Table

(*Continued from page* 44)

every phase of aviation, endeavoring to provide our assureds with a practical and economical program 'tailor-made' for each company. This program is generally self-administered by the company concerned with periodic evaluations made by Liberty Mutual's Aviation Bureau. The enthusiastic approval of our assureds' top management and flight personnel, coupled with a very low loss ratio, gives an indication of the success of this program from both the standpoint of the policyholder and Liberty.

"We have been very successful in conducting our complete ground and flight evaluations without tieing up the business aircraft for any length of time. It is true that we work very closely with our accounts and coordinate our services on a regular basis at their convenience and at their home base."

Capt. Scribner: "To supplement what Al Ueltschi said, perhaps I should relate an experience Pan Am had. Over the years we have found that the age of the pilot, or his accrued years of experience, definitely is not a measurement of that man's ability today to fly an airplane and exercise good judgment. We have also found that when you have a group of 10 or 100 pilots, you will have 10 or 100 different ways of doing something. To rely solely on experience is a mistake. We also found there must be one good way to fly an airplane, one good way to complete the technique involved in an instrument approach.

"Pan American has three divisions controlled almost unilaterally. In going over the training problems, it was quickly brought to light that we also had three standards and so it was decided that we would establish a standardization committee. Out of this committee came one way to do each thing which we considered to be the best. I think a similar system could be applied in many ways."

Jean DuBuque: "I'd like to read you the comments received from an executive of a large corporation in reply to one of the items in the survey questionnaire NBAA mailed out. Our question was, 'Do you conduct pilot proficiency training?'

"The executive replied, 'We do not undertake any on-the-job training, refresher courses or similar methods designed to keep our pilots at top-level efficiency. We employ only licensed multi-engine pilots with instrument ratings who have logged several thousand hours of flying time, proportionate parts of which must be night and instrument time. These pilots are flying practically every day and operating both at night and under all weather conditions. They receive in actual practice sufficient flying under both visual and instrument conditions to keep well qualified.'

"I mention these comments because they express a viewpoint opposite that brought out in this discussion. Strange as it may seem, many pilots actually feel the way this executive does. If we check past accident record statistics, I think we'll find that many of them were due to this type of thinking. A mistake in flight technique is made, then another, and no corrective action is taken. Finally, the pilot becomes indifferent, and eventually he may lose his sense of proportion, neglect his responsibilities and end up a statistic."

Gerard J. Eger: "For just a minute I'd like to refer to something that was brought up just before we started this meeting, and that is the question of administration in this field of corporate flying. To my way of thinking, all pilots have a staff responsibility to their superiors and command responsibility to their copilots, mechanics and everyone else down the line. A lot of pilots do not appreciate that dual responsibility which they and all of us have in business.

"I believe that where corporate top management does not believe that training is an essential part of the operation, it's because the chief pilot has not carried out his staff responsibility to his superior to the right extent. Continued training is a requisite in all phases of business."

Howard Pember: "We seem to agree that pilots should be trained to meet emergency situations, and I believe that review of technique is still the best way to do it. You have an emergency, you live through it and learn from it. Aside from that method, the only other thing to do is to simulate emergencies and learn that way.

"I don't know what the relationship is between technique and judgment, but I'd say that flying is 10% technique and 90% judgment because judgment does not involve getting out of the emergency situation as much as it means avoiding an emergency situation. Judgment is based upon experience, and that old saying, 'Fools learn by experience and wise men by observation' doesn't hold true in this business. We have to simulate these situations and put ourselves through them. A pilot has to have a sense of what to do to meet an emergency, and that comes from training."

Gerard J. Eger: "We've been talking a great deal about operations under emergency conditions, but there is also an extensive field of operation under normal conditions. There is a large area for the acquisition of additional knowledge; how to get the maximum life out of engines, the difference in performance and fuel consumption between various power settings, etc. All of this should be considered under the heading of training."

Al Ueltschi: "I agree with Mr. Eger 100%. If more of the men in Management had the same attitude that he has, we wouldn't have anywhere near the problem that we have right now. There also is a lot more to this business than emergency procedures. Normal operating conditions are a 'must' in any training program.

"You can train a person up to a certain point and that's the end of it for that period of time. You have to let him absorb what you've taught him, and then train him again later on. You can reach a saturation point in training and you have to be careful because if you over-train, he'll start down the hill the other way.

"In discussing the 'how's' of training, I think we ought to stress more crew training than pilot training. We're more concerned about what the team is doing in the airplane than we are about what one man does. If Mr. Chamberlain would check the record, he'll find that there have been several cases where the pilot was doing one thing and the copilot something else, not

(*Continued on page* 48)

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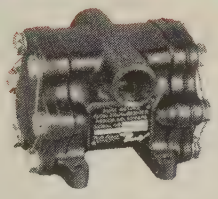

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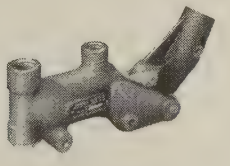

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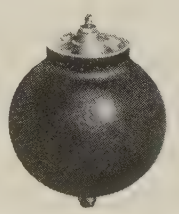

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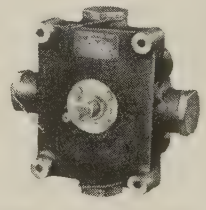

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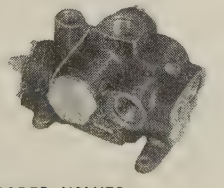

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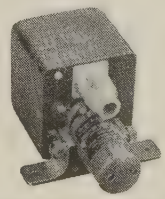

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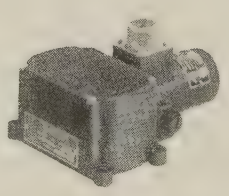

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Skyways Round Table

(*Continued from page* 46)

working as a team. That is the reason behind our belief in crew training. And I don't agree that one man can go to school and then come back and teach the rest of his men."

John M. Chamberlain: "We feel that this training is a very significant part of the whole safety picture, and this is evidenced in the latest revision of the air carrier operating regulations where more attention has been devoted to the problem of crew training, not just pilot training. Crew coordination is spelled out and it certainly is a team proposition all the way.

"Getting back to the basic question of training or no training, the con's take the position that experience is all you need after you've had the original training; the pro's insist that you need experience plus additional training. Unfortunately, there are some things in this business that we just don't get experience in, and for that reason training is necessary.

"On the subject of judgment, there are apparently two thoughts on it here and both of them are extreme. One stated that judgment is something you are either born with or not. I take some exception to that. Someone else mentioned that judgment was experience, and I think that's the other extreme. It seems to me judgment is two things: first, the inherent ability to analyze a problem and think it through to a logical conclusion; and second, armed with a lot of experience, you can come up with the right answer. That experience can be gained either through actually meeting the various situations or by training."

John Lambert: "At the present time the CAR's are pretty well written out in detail, such as what is required of the certificated carriers in the way of pilot proficiency, etc. Now, in the proposed revisions of the Civil Aeronautics Act which, I believe, is in committee in Congress, are they proposing anything specifically along the line of pilot proficiency and training insofar as business aircraft or business pilots are concerned?"

John M. Chamberlain: "No, they are not. We hope that will remain in the realm of regulation, not legislation. I know of nothing specific with respect to legislation on that."

Gerard J. Eger: "The physical condition of a pilot also plays an important part in this business. We had an experience a couple of years ago that I'd like to mention. We had a copilot who had just passed a regular CAA physical examination. Being somewhat new in the aviation business, we didn't know how thorough the examination was and so, having good friends over at United Airlines we arranged for our crews to take the regular United physical examination. Something showed up there which disturbed United's chief of the medical staff and so we sent the copilot to our own doctors. They made some tests and came up with the same conclusion United's medical staff had. We then sent the man to a specialist who confirmed what the other doctors had found, and as a result we had to take the man off flying.

"Now I have no desire to compromise the CAA's rules and regulations on physical condition, but I feel that here is another field in which there is an element of danger and which should be considered."

Harley D. Kysor: "Recently a great deal of attention has been placed on manuals of various types for the business-aircraft operator. For several years we have been designing operations, policy, maintenance and airplane manuals for our assureds as a part of our engineering service. These manuals are the result of careful research and study by our Loss Prevention Department which includes over 300 engineers.

"We have recently written CAA-Approved DC-3 Airplane Flight Manuals for our assureds operating this type aircraft at the increased gross weights of 26,200 lbs and 26,900 lbs. These manuals have been designed, not only in compliance with Special CAR 398 in mind but also to fit the needs of the individual operator. Special Regulation 398, as it is interpreted by the CAA at this date, permits a DC-3 or *Lodestar* to operate at maximum gross weight without consideration for airport altitude. As we all realize, this is not a safe procedure. As a general rule, an increase in airport altitude will necessitate a decrease in gross weight to insure adequate airplane performance. Our Aviation Bureau discovered this oversight in the Regulation and, after consulting with the CAB and the CAA, has written our manuals to meet the highest standards."

Bill Person: *"There is one other thing that should be mentioned and that's accident proneness, which is not necessarily a consistent type. In other words, accident proneness can vary from time to time. Many factors, perhaps concerning a pilot's homelife, may tend to make him accident prone one month and then the next month everything will be fine. In short, there are many, many factors involved in this business of accidents and emergencies. The best thing we can do is to give the pilots all the information they need and then go to their employers or department heads who may not understand the urgency of training and convince them that the company has to have an adequate training program.*

"As Mr. Eger pointed out, company pilots have their top echelon riding in these aircraft. It would seem to me to be very shortsighted to not give the pilots responsible for those lives all the best training and best of everything they can get."

Al Ueltschi: "Just one more thing, Bill. We never tell anyone that because he went through any training he is going to be safer than someone else. We just point out that the man has been exposed to this training which is the best we can give him, but the way he uses it is something else."

Capt. Scribner: "The Air Transport Association is about to implement a new program to collect incident reports which will give us more factual information.

We know there are incidents happening all the time that go unreported for several reasons—the pilot doesn't take time out to report an incident that might expose him to action being taken against him, for example. Therefore, for the purpose of relieving his anxiety, the ATA implemented this program the first of August. Anonymous report blanks are made available. The pilot merely fills in the details and only to the degree he desires as far as dates, flights, etc., are concerned. Then he drops the form in the mail; no name is signed to it at all.

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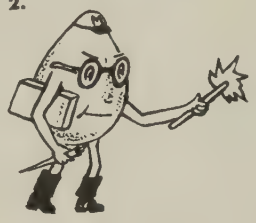

I was an ambitious young fellow, cocky too, I guess . . . Always figured I had a magic touch . . . Well, I heard tell that if you got a good government job and made the right contacts, you had a pretty good chance of getting a BIG job in industry . . . SO I WENT TO WASHINGTON.

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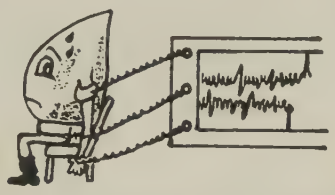


4.

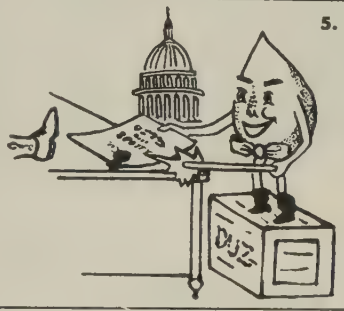
But they finally let me go to work.

. . . In the lab . . .

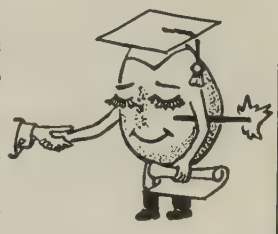
. . . and in a big 2000 H.P. engine

At the end of first year's work THEY WERE IMPRESSED . . . Oil Temperatures DOWN . . . Oil Consumption REDUCED By Over 1/3 . . . Spark Plug Replacements CUT By Nearly 1/2 . . . NO Power Section Maintenance AND . . . Pilots Said The Engine As GOOD AS NEW After 990 Hrs.

5.



6. I Made Good In Washington, AND I'M IN BUSINESS! I'm ready to prove that I can make your plane fly Higher, Faster, Cheaper, SAFER. Ask Your Dealer For Me, Or Drop A Card To My Office At NATIONAL AIRPORT, Washington 1, D. C. I'll Get Right To Work.



***The Civil Aeronautics Administration authorizes the use of Spotoil at a 1 to 9 ratio with non-detergent oils in medium and low-powered aircraft engines, and in engines of Pratt & Whitney manufacture of 2800 cubic inch displacement or less. The aviation testing program did not include detergent type oils. Spotoil has been tested and used with detergent oils in gasoline and diesel engines over a period of years with excellent results.**

Jean DuBuque: "NBAA has a similar near-accident reporting program under consideration by its Flight Safety Committee and we are naturally very interested in this form of approach to a flight problem that grows more serious as air traffic increases. The more information of this nature that can be distributed to business-aircraft operators, the fewer will be the near-misses since the pilot will be alerted as the result of the experience of others."

SUMMARY . . .

Bill Person: *"From the foregoing conversations, business pilot proficiency appears not only to concern his flying but also his ability as an operator and a representative of management. With the pilot rests the responsibility of the growth of this active segment of the aviation industry. With this responsibility the prime consideration is safety.*

The pilot must understand maintenance If the business pilots are interested in something like that, perhaps your NBAA could work it out so that reports or forms are available on an anonymous basis."

and recognize that a dollar saved on the purchase of an aircraft part is not necessarily the safest and, consequently, the most economical way of purchasing. The pilot must be alert to proper aircraft maintenance and keep good records; he must be 'up' on aircraft modification, both engine-wise and structurally, and be able to make the aircraft available for pilot training and still offer to the company the use of the aircraft when it is needed.

"Management proficiency also is important. Without question, the majority of the companies utilizing business aircraft never had any experience in the aviation business prior to owning their own planes. In many instances company executives really do not understand the necessity for pilot training. Therefore, it is actually up to the pilots themselves to educate the bosses so that they will understand the problem and be willing to spend monies for the education and re-education of the pilots. The investment in the Aviation Department, in some cases, exceeds a quarter million dollars and yet the pilot frequently runs into trouble if he wants to attend a professional school. The boss does not understand this expenditure. By the same token, the boss would hesitate to let an executive run a new plant unless he was sure of his qualifications. The new department manager certainly would have to have more than experience and a piece of paper which states that he is a competent executive. The comparison is that the pilot who is running his aviation department in many instances has a much greater responsibility than a proposed plant manager and many less opportunities to improve his standing. I doubt very much if there are many competent executives who wouldn't understand this problem if the pilots would take time out to explain the situation. No one of executive caliber would attempt to hold down an aggressive department head. In other words, not only should you be a proficient pilot but also a proficient businessman. That is your responsibility to your boss, to yourself and to the aviation industry.

"Thank you, gentlemen, for taking part in this discussion."

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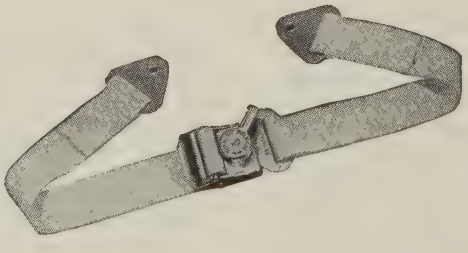

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Cessna 310

(*Continued from page* 12)

and about the same settings, we got into the air around 72 mph. I don't know what my ground run was on these take-offs but it wasn't much in either case because the 310 has a sort of scared-rabbit-in-full-flight air about it when it takes off. We climbed out at a figure well under the best published rate-of-climb for this twin, which is 1700 fpm at the 4600-lb gross, but we got out of the Teterboro traffic pattern fast—so fast I'm sure we caused no annoyance in that area.

I had seen no figures on the 310 performance before this flight, although I had heard that its cruise was 200 mph plus. My notes show that at 8,000 ft, outside air temperature of 50°, 21.5 inches and 2300 rpm, we were indicating 180, which trued out to 208 mph. That's a bit better than Cessna's published figure of 205 mph at 70% of power at that altitude.

At the end of my first climb-out I knew I was flying a very stable airplane, and that stability was proved during my look at the 310's single-engine performance. Just for my own amazement, I held a 30° heading and cut the right prop while my two large Brogans were planted firmly on the floor. The 310 was then indicating about 180 mph at 65% of power. Using ailerons only, I held to that heading during the feathering operation and during the period the airplane took to stabilize out. For the professional pilot, this feet-on-the-floor performance means he's driving an inherently stable aircraft.

Nothing out of the ordinary showed up as I examined the stall performance of the 310. Stall characteristics are about normal in all configurations, with mild buffeting between 5 and 10 mph above the stall—plenty enough to wake me up. A Safe Flight indicator provides visual and aural warning of the approaching stall.

For the benefit of business-aircraft pilots who must fly into some mighty short fields at times, the flaps on the 310 are of the split type and can be extended to 45°. They are high-drag rather than high-lift flaps. The ability to extend the flaps to 45° permits a relatively slow, steep approach for short landings over an obstacle. Flaps can be lowered at any airspeed below 130 mph. They are electrically operated by a three-position toggle switch on the right side of the pedestal and can be held at any setting between 0 and 45°.

The 310 also is a comfortable airplane. It's easy to get into and out of and, once inside, offers extreme comfort. The individually mounted front seats are on tracks for fore and aft adjustment and they can be set to three reclining positions. The rear seat provides plenty of leg, hip and shoulder room for three and is hinged at the bottom to permit adjustment.

There is only one door in this new five-place aircraft, but the left rear window is also an emergency exit. Installed to meet Canadian requirements, this window falls out when a pull ring is tugged. I wonder why this is only a Canadian specification? It certainly would be a worthwhile safety device on all aircraft of this type.

(*Continued on page* 52)

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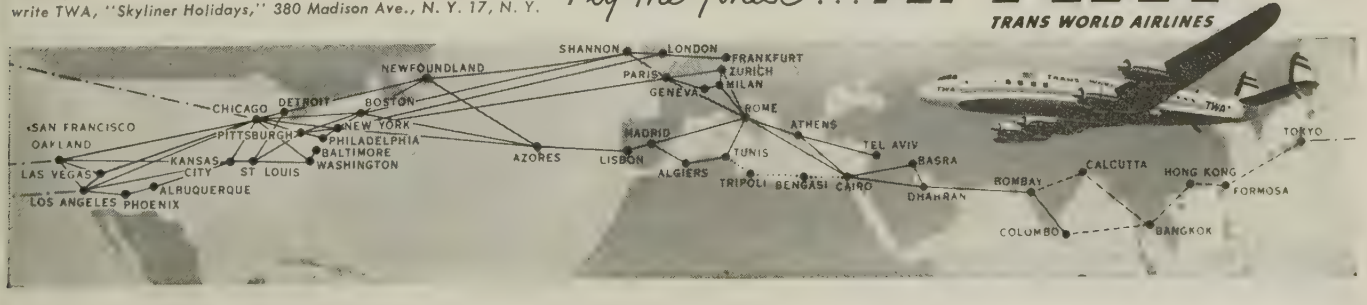

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The many advanced features of the MB-3 are too numerous to list here but you should know that while other makes of marker receivers *may* offer comparable performance they all *weigh more and cost more* than the MB-3!

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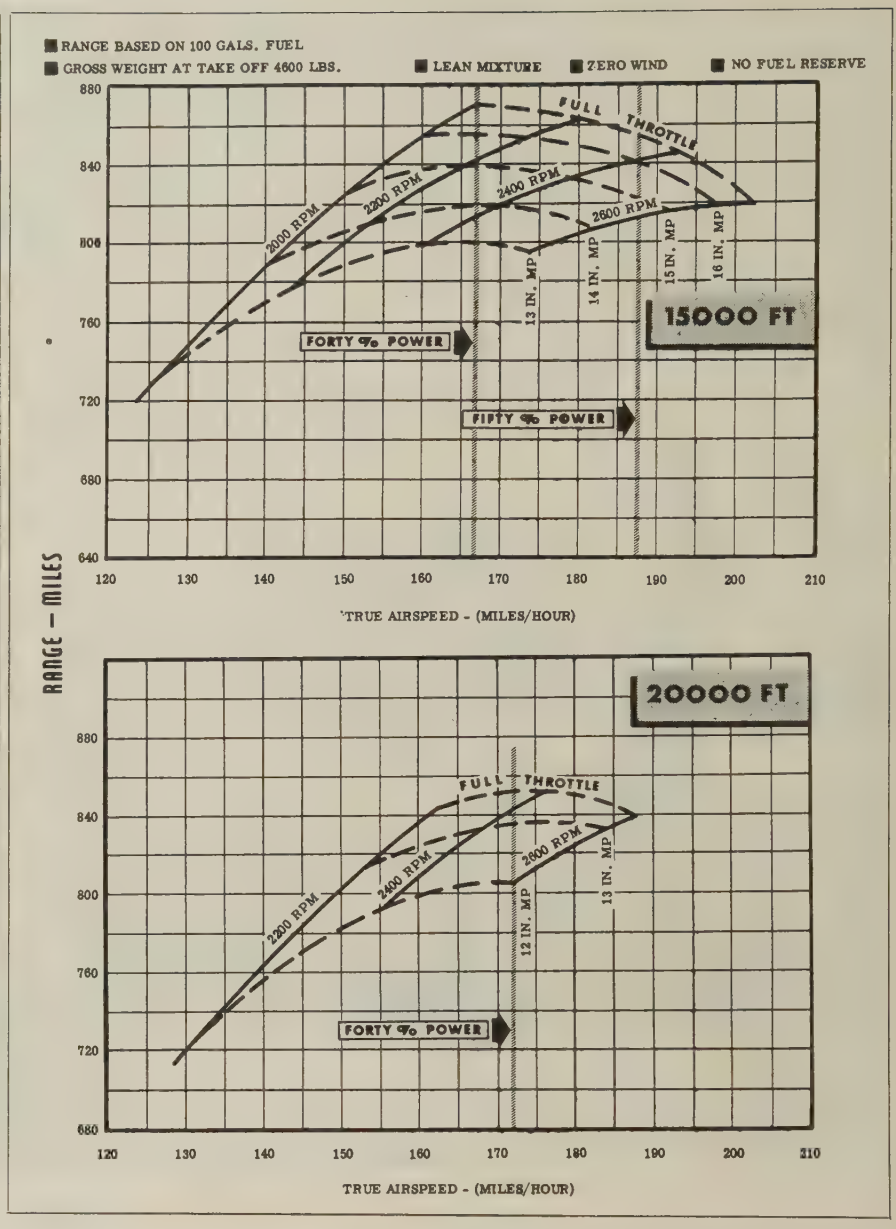


Cessna 310

(*Continued from page* 50)

The useful load of the 310 is higher than any other five-place twin on the market, 1,750 lbs when the gross is 4600 lbs. The baggage compartment is wide and deep.

Cessna contends that the cabin sound level is considered good by other twin standards, but I found it a bit on the high side and so did our passengers in the rear seat. One important factor in the noise level is the position of the augmenter tubes opposite the rear windows of the cabin. I understand that the tubes cannot be extended because the extension would create turbulence in the exhaust and defeat the purpose of the augmenters, so it appears that double windows in the cabin or other sound-proofing may have to be the solution.

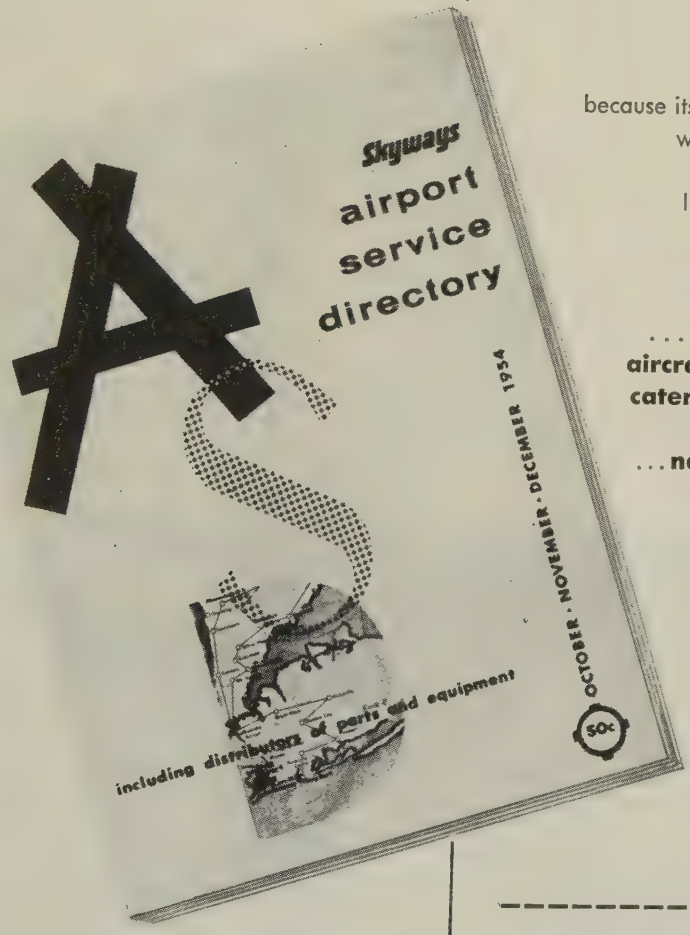
The price tag on this new Cessna twin is $49,950 and you get a lot of airplane and a lot of performance for that amount. Fred Roscoe, one of the best salesman-pilots I have run across in many a year, informs me that Cessna will guarantee that price to a specific date on every order accepted. When an order is received, Cessna immediately confirms the delivery date—plus or minus 90 days.

The Cessna 310 is a beautifully designed aircraft with a high standard of performance that will assure its acceptance among the growing ranks of business and other utility aircraft owners. If Cessna plans to demonstrate the 310 for the benefit of delegates to the NBAA convention in Dallas this month, I hope that I shall have an opportunity to get better acquainted with this new business twin which impressed me so much during our first meeting.

CESSNA 310 PERFORMANCE

Gross Load	4600 lbs
Top Speed (SL)	Over 220 mph
Cruise 70% Power @ 8,000′	Over 205 mph
Cruise 60% Power @ 10,000′	Over 190 mph
Cruise 50% Power @ 10,000′	Over 175 mph
Climb, Two-Engine SL	1700 fpm
Service Ceiling, Two-Engine	20,000 ft
Range 60% Power 10,000′	875 miles
Range 50% Power 10,000′	1,000 miles
Single-Engine Service Ceiling	7500 ft
Single-Engine Climb SL	380 fpm

it serves the pilot right!



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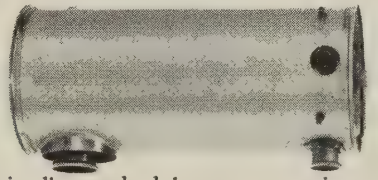

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Joe

Janitrol Aircraft-Automotive Division, Surface Combustion Corporation, Columbus 16, Ohio.

POPULAR *business aircraft is the venerable DC-3. This one is owned, operated by Sawhill Manufacturing Co., Sharon, Pa. Chief Pilot and NBAA representative is Ralph Matthews*

Business Aviation

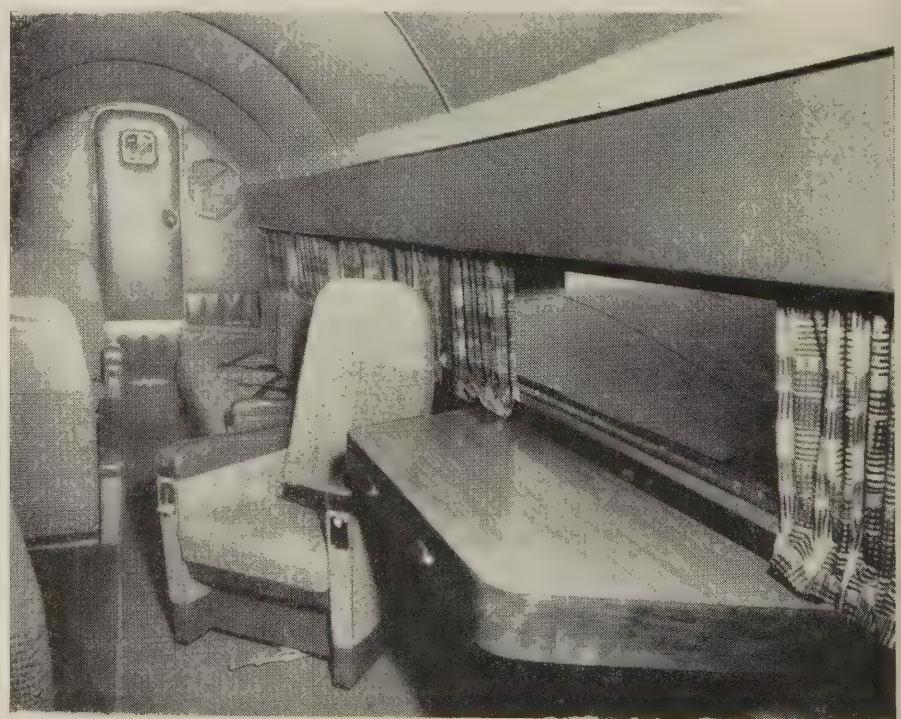
(*Continued from page 9*)

The picture is not as completely bright as the preceding paragraph would indicate, however. While many airport service operators have geared their services to handle business-aircraft needs, others have been slow to do so because they have not taken the time to determine exactly the types of services most in demand. In some areas, there are four to six operators all competing for the same business-aircraft dollar and trying for it with inadequate facilities and manpower.

The situation on the pilots' side also is spotty. Business pilots who have been on the job for several years generally know exactly where to find good line and overhaul service, if they are not performed in their own shop hangars. Pilots new to business flying, however, many times must do a lot of exploring before they find an airport service operator geared to handle their work. The fact that some fleets include modified war-surplus aircraft, for which parts are sometimes difficult to find, complicates the picture. Generally, however, there is a new awareness of the importance of business-aircraft operations as a good and steady source of income and airport service operators are beginning to hitch their wagons to that steady star. The issuance of such publications as the new SKYWAYS' *Airport Service Directory*, a quarterly, is going to help both business pilots and the airport service operators who serve them.

From the vantage point of 1954, which marks the seventh anniversary of the founding of the National Business Aircraft Association, the future looks promising despite some knotty problems.

Among the problems with which business-aircraft operators will be concerned in the months just ahead are the acceptance rate at high-density traffic airports, proper development of airports in industrial areas,



CONVERSIONS, *often costing several times purchase price of the airplane, make luxurious flying offices out of ex-airline transports. This Lodestar interior was done by Universal*

improvements in ground handling of aircraft at airports, expansion and improvement of aircraft storage, maintenance and overhaul facilities, air traffic control at airports handling both turbojet and piston-engine aircraft, aircraft safety, standardization of maintenance procedures, pilot proficiency, and a host of allied problems.

The problem of airport improvement is near the top of the list of continuing problems which must be tackled by business-aircraft operators. Airport development has not kept pace with progress in aviation generally and the new criteria for Federal aid to airports may prevent Federal participation in planned expansion programs at many of the nation's Class 3, 4 and 5 airports. Those criteria restrict expenditures from the $22,000,000 appropriation just approved to airports having an annual passenger traffic of 3,000 or more or at least 30 based aircraft, or some satisfactory combination of the two. These restrictions will, it is believed, place the major financial responsibility for airport development on the states, counties and communities.

After careful study of the nation's airport situation, NBAA is of the opinion that the Strato-Port project (SKYWAYS, *August 1952*) offers one of the most promising solutions thus far advanced to meet the increasingly serious problems of airport location and cost. This is especially true in off-airway industrial areas where many airports are inadequate or there are no airports at all.

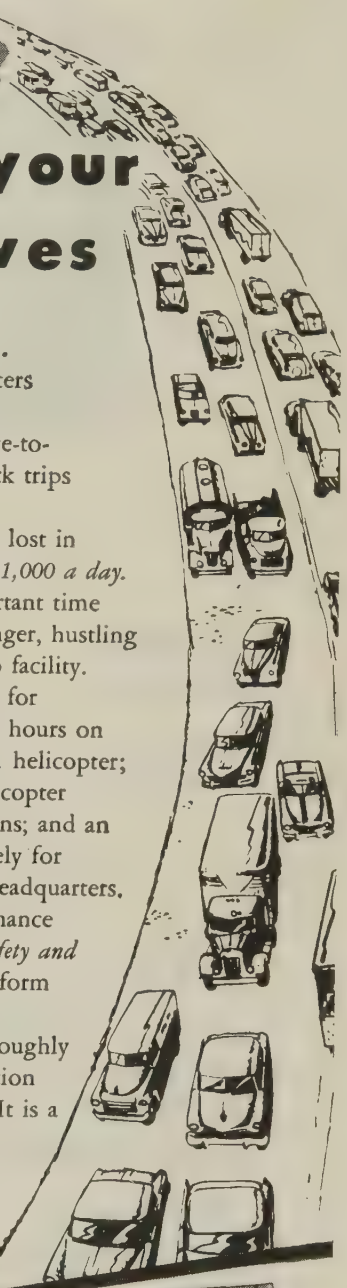
Approximately 70% of today's business flying is away from regular air routes and into small industrial communities. In many cases, these communities do not have either the funds or land for the development of conventional multi-runway airports. An acute need, therefore, exists for low cost yet adequate landing facilities, capable of handling all types of air traffic regardless of prevailing wind direction and velocity.

In addition to the small community airport problem, the Strato-Port project could be practically applied to major high-density airports, like Dallas and Newark, which are closely surrounded by commercial and residential areas. In these cases, dual runways with the unique perforated "Wind Eater" fence installations paralleling the runways that characterize the Strato-Port, may well simplify air traffic control, increase landing approach safety, by-pass dangerous runway obstructions, and reduce operational and maintenance costs. Also the growing difficulties and cost of land acquisition in densely populated areas, the mounting criticism of aircraft noise, and the recognized hazards of aircraft criss-crossing the airspace at low altitudes over communities near the airport, could be materially diminished by the one-direction runway concept.

NBAA strongly supports the need for a full-scale test and evaluation of the Strato-Port to determine the practicability of its design features and its potential value in meeting the growing airport dilemma around the nation.

In the area of aircraft better suited to business requirements than most of those in use, the picture is very bright. This year saw the introduction of the Cessna 310, a medium twin with excellent performance and a price tag of $49,000; the Piper *Apache*, a light twin with remarkably

don't let *Traffic* tie-up your executives



There's an easy solution...
Today's executives are turning to Bell helicopters to avoid surface traffic jams and save valuable hours in traveling from factory-to-factory, office-to-factory, factory-to-airport and for safe and quick trips to nearby communities.

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Port of New York Authority cut travel time for executive and engineering personnel from two hours on the ground to 20 minutes with a 3-place Bell helicopter; a New Jersey utility company developed a helicopter shuttle run between widely scattered installations; and an East Coast executive uses a helicopter exclusively for business trips in a radius of 100 miles of his headquarters.

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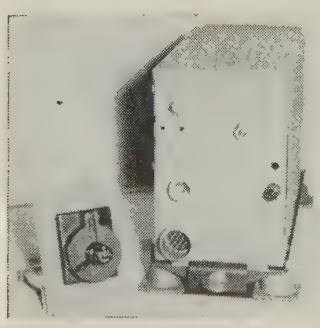

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Business Aviation

(*Continued from page* 55)

satisfactory performance; and an extensively improved version of the Beech Model 18. These aircraft fill voids that have long existed in the list of types available to business operators.

And, in August, Cessna announced plans to build the nation's first four-engine transport designed specifically for the business market. Known as the 620, this new multi-engine aircraft promises to provide the speed, range, altitude, comfort and over-all performance that many business users have been waiting for. The prototype of the 620 is scheduled to fly in January, 1955. Although this model does not fully meet all of the National Business Aircraft Association's design and performance recommendations for a business airplane, it is a long stride in the right direction.

On the basis of its growth since the end of World War II and the anticipated expansion of business in general, the next 10 years should be a golden decade in the progress of business-aircraft use.

There are presently about 40,000 corporations in the nation with assets of $1 million or more and virtually all of them have interstate business connections or interests. There is another group of almost 30,000 companies with assets ranging between $500,000 and $1 million.

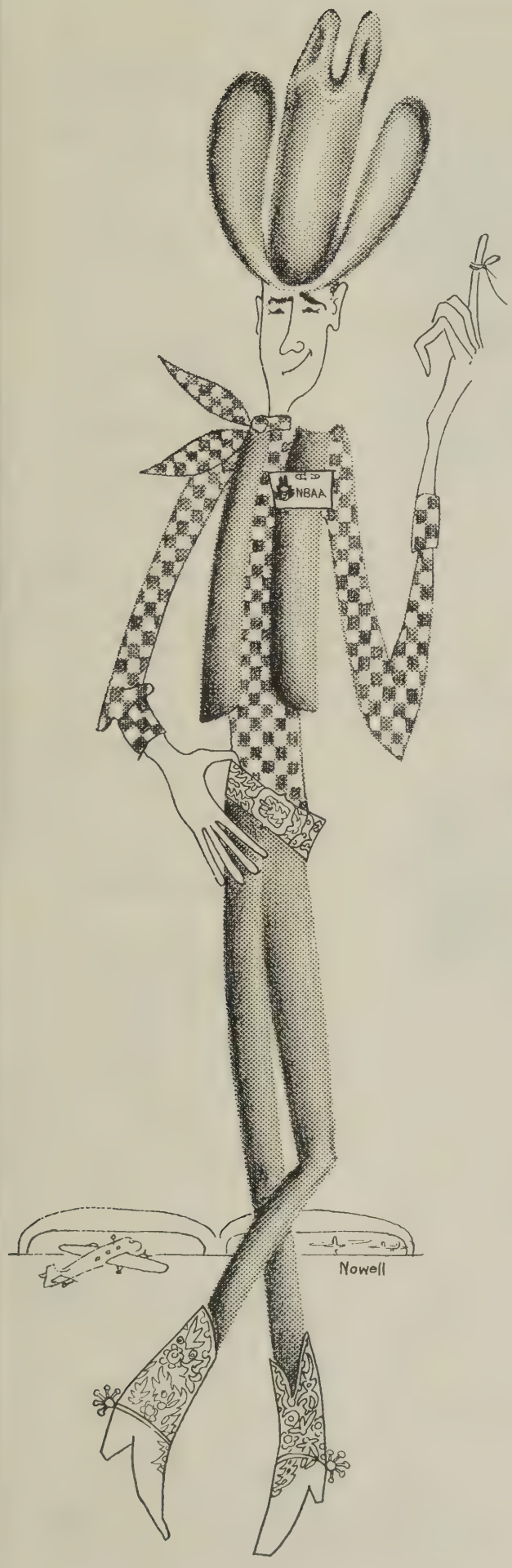
If the use of aircraft in business continues the growth pattern maintained in the past few years, a large number of these companies can be expected to purchase aircraft. If, in the next 10 years, only one-third of these 70,000 corporations bought one airplane apiece, the total business fleet of single and multi-engine aircraft would pass the 30,000-mark. We are confident that the business fleet will approach that figure in 10 years, barring a major setback in the nation's economy or a national emergency.

With owners of the present business-aircraft fleet spending in excess of $400 million to operate and maintain their aircraft and to cover salaries and insurance, a fleet of the size anticipated in the next decade probably would call for similar expenditures in the neighborhood of $1 billion.

The era of flying strictly as a sport appears to be gone forever. The airplane as an essential tool in business and industry has been discovered by thousands of companies and new ones are turning to it every day to help them meet and cope with the rising tempo of business competition, to expand their geographical courage, and to add to the prestige of their operations. This type of airplane exploitation will continue until the vast potential of this new market has been realized.

The airplane as a tool in business is making itself increasingly felt in the general economy. But, as the saying goes, we "ain't seen nothing yet."

Many problems in the realm of business flying still must be solved, but none is insurmountable to the corporation executives who are spearheading the expansion of this segment of aviation. The growth pattern established in the past eight years is strong proof that, barring a disruption in the national economy or development of a national emergency, the use of aircraft in business will continue its upward spiral indefinitely into the future.



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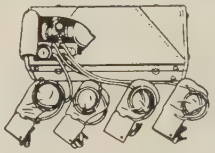

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Scheduling of Overhaul

(*Continued from page* 13)

formity with scheduled requirements, it is obvious that the scheduled date of flyaway cannot be met. Such evidence usually is apparent well in advance of the scheduled completion date.

The kind of schedule form used is a function of the type of overhaul operation being performed. For example, at a maintenance facility where production-line operations are used, the kind of schedule will be different from a base where the air transports remain stationary in the hangar while the work is being performed.

Working Day Analysis: All schedules prepared in advance of the work are predicated on an accurate estimate of the work to be done and the number of man-hours required to accomplish the work. The estimated man-hours are then translated into working days. Normally, the estimate for the man-hours required is based on past performance for similar kinds of work. *Fig. 1* shows typical labor distribution set up in a coordinate form with the working days and calendar days plotted against the man-hours direct labor and the number of personnel. Note that the work is divided into three phases, *i.e.*, prehanger, hangar and shops, and flight line. The various expenditures of labor vary from day to day and the total man-hours expended each day is shown.

Another kind of graphical portrayal of a schedule is by simple bar graphs. This is the kind of a schedule that can be shown to the customer in advance to show the over-all work load in a maintenance facility. The estimated work load can be forecast a month or more in advance, and such operations as engine installations or flight-line operations also can be reasonably forecast. The bar graph also makes it possible to determine the work load and the manpower requirements in advance.

Where several large air transports are scheduled for conversion or overhaul involving major work, a schedule such as shown in *Fig. 2 is* useful. It sets up the anticipated schedule date, the pre-planned date at which the three basic shop operations are to begin and end as well as the anticipated labor requirements. It does not show definite delivery dates. Over-all planning can be guided by such a portrayal of schedule data.

Maintenance Schedule: The function of the production-line schedule, is to provide detailed shop information as to the movement of the aircraft from one station to the next succeeding station. The schedule is a progressive one and the normal work scheduled to be completed at each station must be accomplished within the allotted schedule time. This kind of schedule is used where a maintenance base is performing a military contract on aircraft. Normally, this kind of schedule assumes that parts, man-power, and tools will be available to do the work, and that rework operations will be held to a minimum due to the repetition of work of the same kind at each station.

Work Flow Time: It is assumed that an air transport will arrive at the overhaul center at the specified date agreed to by the customer. At that time, inspection and other appropriate personnel will board the

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air transport and survey the necessary work to be accomplished in compliance with the customer's specifications as outlined in his contract or purchase order.

But what is meant by the term "flow time?" Flow time is definable as that duration of working days which are estimated will be required to perform the customer's requirements to completion. The flow time to accomplish the work is obtained by reference to previous work records and the delegation of necessary manpower to accomplish the repairs or rework in the time specified. When the other basic factors are all correlated, then it is possible to predict the flow time and duration of time the air transport will be inactive.

The flow time for each major operation must be properly evaluated. A thorough knowledge of the engineering and labor factors is necessary to predict the flow time required. For example, if the air transport requires a complete fuel-tank sealing operation, it is obvious that it will be difficult to perform this phase of the work while other preliminary operations such as preparation for overhaul are underway. On the other hand, if the fuel tanks require only partial sealing, repair, and minor leak stoppage, it will be possible to schedule the plane for routine overhaul operations. Complete sealing of the fuel tanks involves the time required for drying of the sealant. In wet or cold weather cure sealants at a slower rate than in warm weather, and require the use of heaters to accelerate the drying. This should be considered in the schedule.

Major Modifications: There also exists other items of work that may affect the schedule and that is the extent of the major modifications, some of which may not be known in advance of setting up the schedule. Normally, major modifications comprise the following:

(1) CAA Airworthiness Directive compliances.
(2) Fuel tank stripping and resealing.
(3) Cabin modifications.
(4) Fuel system modifications.
(5) Radio equipment modifications.
(6) Electrical equipment modifications.
(7) Special customer items.

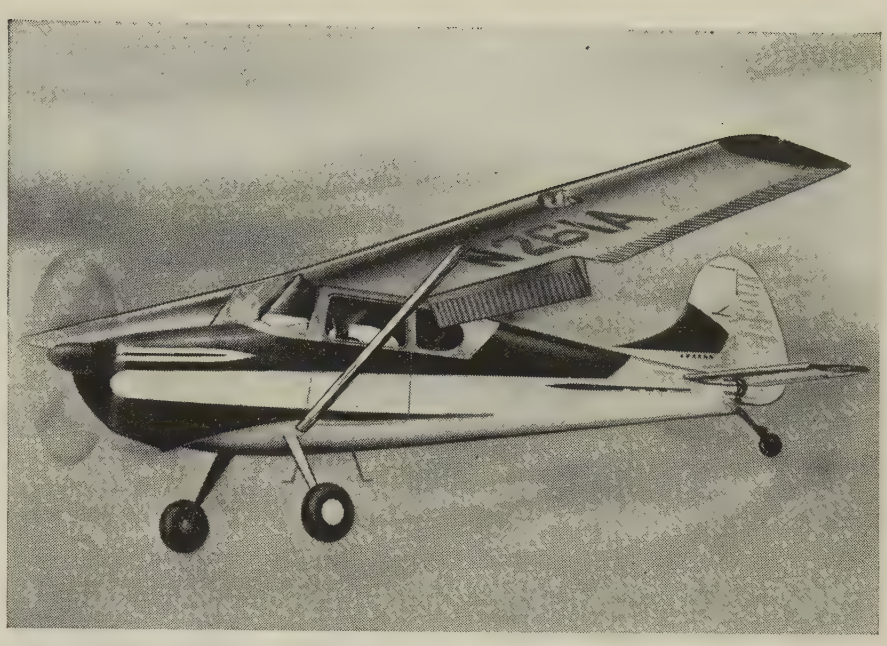
In reference to the fuel tank sealing, the customer may decide that only a partial resealing or a repair operation is all that is necessary. That, however, is beside the point. If the inspection personnel at the base find that in their opinion a complete stripping and resealing operation is necessary to make the fuel tanks airworthy, that will affect the schedule.

Such items as cabin modifications, when undertaken, may reveal that other basic repairs also have to be made. Normally, this will not occur but it is best to allow for it.

Usually, the man-hours required to accomplish fuel system modifications, radio equipment modifications, and electrical equipment modifications are known in advance. But items such as special equipment may not be known and, therefore, may influence the schedule.

Inspection Discrepancies: Depending upon the condition of the air transport, the number of man-hours expended as a result of inspection discrepancies can be considerable. Usually, a nominal allowance is made for the inspection discrepancies in the

(*Continued on page 64*)



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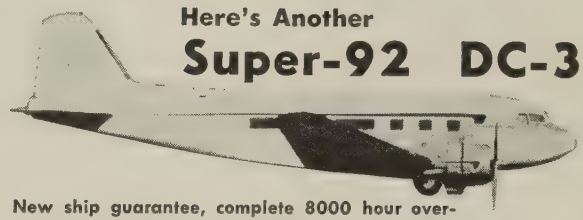

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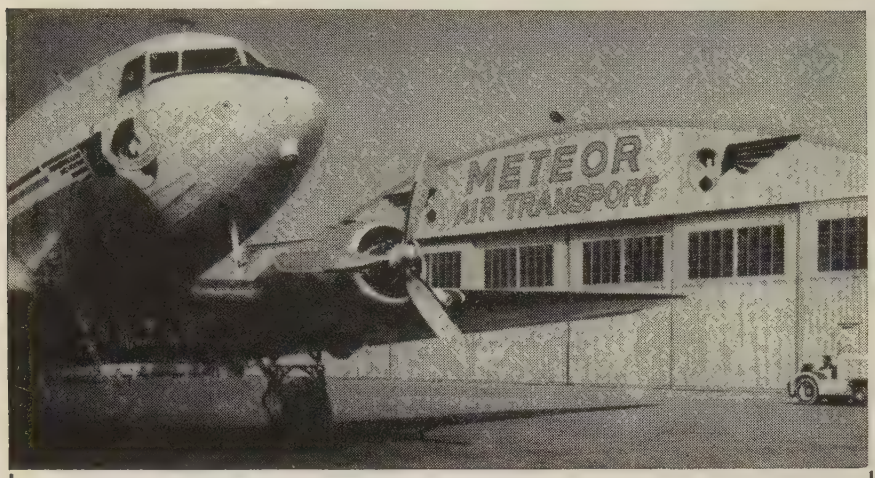

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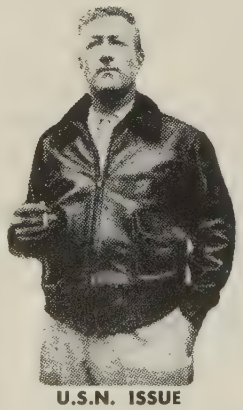

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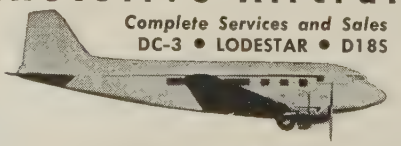

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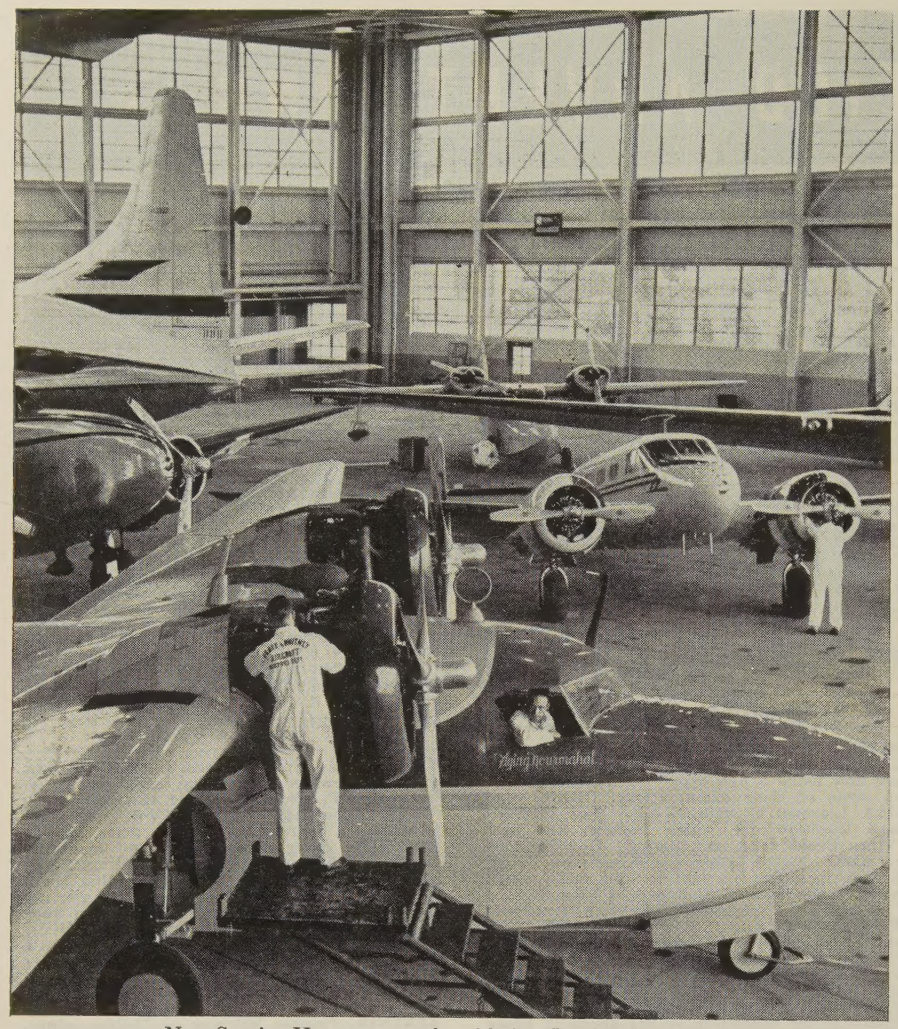

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Scheduling of Overhaul

(*Continued from page* 59)

estimate of the total man-hours to be expended. However, to make certain that the inspection discrepancies will not impede the schedule of completion, a review of the aircraft's historical forms is made by the inspection personnel before the detailed work of overhaul is undertaken. This information will reveal the extent of the work required to correct discrepancies. Thus, an estimate is made and the necessary additional manpower assigned as the project develops. A percentage factor is always allowed in the initial estimate to account for inspection discrepancy as well as errors and rework. On an air transport undergoing major overhaul, a percentage factor of 10% should be allowed in addition to the man-hours estimated to do the overhaul.

Revision of Overhaul: When certain factors which affect schedules cannot be reflected or absorbed in the schedule, a new schedule should be issued to the shop and to the customers. The data delineated by the schedule will either accelerate or decelerate the schedule of completion. This may be caused by conditions other than inspection discrepancies or extra work, such as failure to acquire certain raw material or airplane parts as required.

Schedule Control: A schedule is meaningless unless control and compliance with that schedule is mandatory. For example, the budget for the available man-hours that can be expended on a certain project must be checked each working day. If, for example, 6,000 man-hours must be expended in 20 working days for the completion of a specific project, then, with allowances already made for errors, rework, inspection discrepancy, delay in the acquisition of purchased parts, etc., 300 man-hours must be expended each working day to complete the project on time. If the daily review of the man-hours reveals that fewer man-hours are assigned than specified, a request to the shop superintendent to comply with the schedule would be in order. However, this request is based on a premise that no rework or less than average working efficiency is tolerated if the budgeted hours are to be expended profitably.

When the daily man-hour expenditure analysis shows that the man-hour expenditure is less than anticipated, it may not always indicate that the work is not going according to schedule. It may happen that the airplane is in better condition than anticipated or that a speed up in the work is possible. However, each day the schedule vs. the labor expenditure in relation to the actual work accomplished should be checked. This information should be relayed to the customer or his representative. Remember that we are considering an average labor expenditure. At the start of an overhaul project, particularly in the first phase, the man-hours expended may be less than scheduled while in the second and third phases it may conceivably rise. In the over-all, however, the average working day labor expenditure should be in accordance with the schedule. And to comply with the schedule requires cooperation by all mechanical personnel and a close daily analysis of all factors that militate against the schedule.

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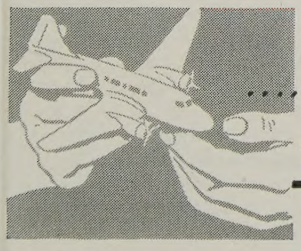

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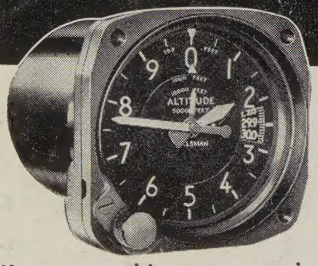
FLY WEATHER-WISE

[These weather items prepared in consultation with the United States Weather Bureau]

In summer, sharp static on the radio is a good sign of thunderstorm activity within 100 miles. Look to the west or southwest for cloud build-ups for approaching storms.



Keep your altimeter set to the latest official settings, reported from stations along your route. Otherwise, it will indicate higher than true height when flying into lower pressures.

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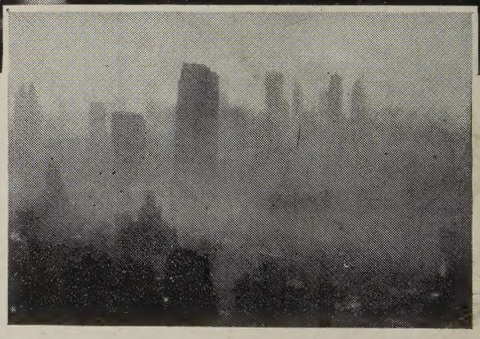
Early morning stratus clouds will generally dissipate by mid-morning if no other cloud layers are above.



In otherwise fine weather, it may be impossible to maintain VFR flight, because of haze. Get above the haze level at 4 to 8 thousand feet for best visibility. Figure on poorer visibility when headed into sun.

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